L’Espionage Magazine

Volume Three: Summer 2021

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Cover picture: Janine de Greef, of the *Comet Line* who helped downed Allied airmen escape Nazi-occupied France during World War II.

If you have a submission for the ***L'Espionage Magazine*** feel free to contact the Editor in Chief at

pbruskiewich @ gmail.com.

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Ms. de Greef received the British King's Medal for Courage in the Cause of Freedom, an award to non-British nationals, the U.S. Medal of Freedom as well as Belgian and French awards for her resistance work.

Her citation for the King's Medal read:

> "*In all her work for the Allied cause, Mademoiselle Janine de Greef proved herself to be a most courageous, loyal and patriotic helper*."

L’Espionage Welcomes Submissions

Obelisk Press of Vancouver is proud to publish the third edition of ***L’Espionage Magazine***.

This edition of ***L’Espionage Magazine*** is dedicated to Mademoiselle Janine de Greef, of the Comet Line … a hero of the resistance who passed away recently at age 95.

The ***L’Espionage Magazine*** board is comprised of the unpaid volunteers:

Please feel free to send your short story, essays or article submissions to the Editor in Chief at

pbruskiewich @ gmail.com.

There is no fee to submit. There is no writer’s fee provided by the journal for those who submit. The publishing rights remain with the writer.

The theme for the **Fall 2021** edition of ***L’EspionageMagazine*** will be about National Technical Means (NTM).

Articles about True Events

Dr. Hideki Yukawa Comes to America (1948 – 1954)

by Patrick Bruskiewich
Director, Vancouver Institute of Advanced Studies

{Disclaimer from the Editor: Patrick Bruskiewich's statements of fact and analysis do not necessarily reflect the official views of any government, past or present, including those of the United States or Japan.}

Dr. I. I. Rabi won the 1944 Nobel Prize in Physics for his work on electron spin resonance.

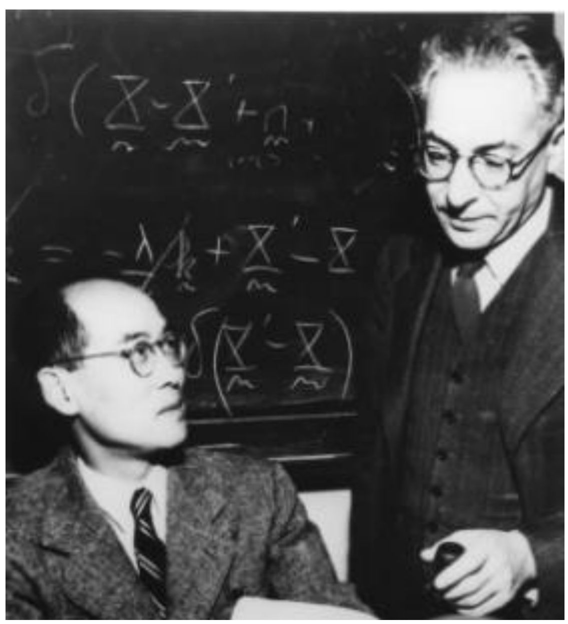

Fig. 1: Dr. I. I. Rabi with Dr. Hideki Yukawa (Columbia, circa 1949)

Dr. Rabi was a well respected physics professor at Columbia University from 1923 (when he did a Master's Thesis with Dr. Albert Willis) to 1988, the year of his passing. Rabi was one of the Godfather's of 20th century American science. [1]

A few years before he died of ocular melanoma, Dr. I.I. Rabi (1898 – 1988) and his wife Helen (née Newmark, 1914 – 2016) paid a week-long visit to the Physics Department of the University of British Columbia, in Vancouver, Canada. As a young undergraduate I was asked by UBC and by one of my professors Dr. Meyer Bloom (1928 -2016) to help host Isidor's visit (I use his first name because Dr. Rabi gave me permission to address him by his first name). Meyer had taught me Quantum Physics and he thought me to be one of the best student he had on the subject over his four decades of teaching at UBC. In the 1960's Meyer established the Nuclear Magnetic Resonance (NMR) lab at the UBC Physics Department. Meyer is also famous for undertaking the transverse Stern-Gerlach Experiment with Dr. Karl Erdman of UBC. [2] [3]

During his 1985 visit to Vancouver Dr. Rabi also toured TRIUMF. TRIUMF is Canada's premier nuclear accelerator laboratory and is located on the south campus of UBC. In an informal conversation with its director Dr. Erich Vogt, Isidor inquired whether a proton beam could be set up to treat his ocular melanoma. While this undertaking would not be forthcoming before his passing in 1988, this informal conversation became the beginnings of the proton therapy program at TRIUMF which was established a decade after Isidor's visit.

After his visit to the Physics Department and to TRIUMF. Dr. Rabi and his wife Helen flew directly to CERN, a lab he helped to establish in Europe. Dr. Rabi invited me to join them on this trip but I had to decline because I did not have a passport at the time. If I had a passport at hand I would have packed a small bag and joined them on their trip. Dr. Rabi was prepared to purchase the ticket and pay for all my trip expenses out of his scholarly grants he received from the American Academy of Science and Columbia University.

As you read this article you may begin to understand the reasons why Isidor extended to me scholarly courtesy. As a Catholic my calling was decided by my Polish grandfather and I in 1978 with the election of a Polish Pope John Paul II. My calling was to help bring a peaceful end to the Cold War. I am also a very capable nuclear physicist (having been taught this subject by many luminary nuclear physicists).

In the 1980's many of the scientists who established the nuclear age and the madness of *Mutual Assured Destruction* were getting on in age and passing away. Some, like Isidor, worried for the future of humanity and turned to young scientists with a conscience to mentor them and help them bring a peaceful end to the Cold War. In subsequent years many professors from Columbia University, including Hans Bethe, and throughout the United States, would accord to me their valuable time and confidence based on a personal recommendation by Dr. I. I. Rabi.

In his last days in 1988, as cancer spread throughout his body, Isidor was reminded of his greatest achievement when his physicians examined him using NMR. To his attending physician he remarked: "*I saw myself in that machine... I never thought my work would come to this*." He died in his bed on January 11th, 1988.

The summer previous to Dr. Rabi's visit to UBC I had worked on an interesting experiment at TRIUMF that involved muon capture within the nucleus. The experiment was a confirmation of calculations that were made by Dr. J. Robert Oppenheimer and Dr. Hideki Yukawa during Dr. Yukawa's year-long stay at the Princeton Institute for Advanced Studies in 1948/49 (Fig. 2: Dr. J.R. Oppenheimer with Dr. Yukawa, PIAS (1949).

Fig. 2: Dr. J.R. Oppenheimer with Dr. Yukawa, PIAS (1949)

It thrilled Dr. Rabi to hear that I was part of a nuclear physics experiment confirming the theoretical efforts of two of his closest friends “Oppie” and Hideki.

In Isidor’s Own Word …

In Isidor’s own words, expressed to me nearly four decades ago, let me explain the reason why Yukawa was brought to America and why after a year at Princeton Institute for Advanced Studies (PIAS), Yukawa would go to Columbia in 1949.

After the atomic bombing of Hiroshima and Nagasaki, and after the surrender of Japan in September 1945, a cursory investigation of Japanese wartime nuclear research was undertaken by ‘scientifically inept bureaucrats’ (Isidor’s words) of the American occupying authority. This investigation was by no means as extensive as the Alsos Mission to Germany, which itself was incomplete given its lack of access to locations within the Soviet Zone, as well as a lack of honesty by German scientists. [4]

In their mad rush to close the final chapter of history known as the Second World War, the investigators took what was said to them by Japanese scientists like Dr. Yoshio Nishina, at their word. The Japanese had decided not to cooperate with the occupying forces when it came to disclosing their wartime nuclear research.

Due to this lack of cooperation by Dr. Yoshio Nishina and his colleagues the decision was made within the Manhattan District to deprive Dr. Yoshio Nishina and his colleagues of their two cyclotrons. The cyclotrons were dismantled and tossed into Tokyo Bay. The message was clear: Dr. Nishina hoped to be the first Japanese scientist to win a Nobel Prize. Without his cyclotrons he would never make the fundamental discoveries that he hoped to make that would earn him a Nobel Prize.

In the aftermath of defeat, Dr. Nishina and his colleagues had crafted a careful, obfuscating history that, among other things, explained that they had not mastered the chemistry of Uranium Hexafluoride, and did not achieve any degree of enrichment of ^{235}U, in particular using the so called Clusius-Dickel process that the Germany shared with them during the war. As revelations by independent sources like Dr. Paul Kuroda would show, nothing was further from the truth.

In 1947 when rumors began to circulate in Washington of extensive wartime Japanese nuclear research facilities in North Korea, and of contemporary nuclear work being done by the Soviets in North Korea, a second investigation was opened (the final report of this second inquiry still remains classified) into nuclear related activities in Konan (Hungnam) and around North Korea. The newly formed Central Intelligence Agency would also begin their own investigations in 1948.

In 1947 Dr. Nishina and several scientists in the know were asked to 'come clean' about Japanese wartime nuclear research. There were only a handful of Japanese scientist who 'came clean' and one was Dr. Hideki Yukawa.

In Dr. Rabi's own words:

> *"I knew Nishina and neither trusted him, nor his judgment. He was very old school Japanese and crafty. Hideki, on the other hand, was incapable of lying, but sometimes he was quiet. Hideki was a very precise and brilliant thinker. If you needed a specific answer from him, you had to ask a specific question ... when asked specific questions in a knowledgeable and scientific fashion ... he provided specific and accurate answers in return. Unlike Nishina who was a nationalist, Hideki was an internationalist. "Oppie" and I were both on the AEC at the time. We met and discussed nuclear policy matters quite often. We read the 1947 report about Japanese wartime nuclear work, and knew we needed to get to the bottom of what was going on in North Korea. This is why Yukawa was invited to America ... he was willing to tell us the truth ... In 1947"Oppie" and I made arrangements to invite Hideki to America, and to do so very publicly. We decided that if Yukawa cooperated with us we would recommend him for a Nobel Prize. and help him become the spiritual leader of post war science in Japan… I looked after the Nobel Prize side of things ... It was to be out with the old (Nishina) ... and in with the new! ... After Yukawa won his Nobel Prize in 1949, we didn't expect things to turn into such a street brawl!"*

I asked Isidor what he meant by 'such a street brawl.' He explained that he had grown up on the rough and tumble streets of New York. The nationalist Nishina and his clique turned the whole matter into a street brawl with the internationalists and Yukawa in particular, and that the battle between the two scientists and their cliques was a microcosm of sorts of Japanese post-war politics: ... cooperate/ don't cooperate; Go it alone/ become part of the United Nations; Get back at the Americans/move on and get on with life … Things changed quickly after North Korea invaded the South in 1950. The old school lost out …

In 1947, around the time that the second investigation was ongoing and rumors began to circulate that Dr. Yukawa would be going to America, in a brazen defiance of the occupying authorities, and to assert his place in the post-war Japanese scientific world, Dr. Nishina asked to be published in the *Bulletin of Atomic Scientists* a memorandum he wrote in 1945 about the cyclotron issue.

Here is the article in its entirety (**SCAP** means Supreme Commander for the Allied Powers – from August 1945 to April 1951, a position held by Five Star General Douglas MacArthur until he was fired by President Truman for insubordination).

*****

A JAPANESE SCIENTIST DESCRIBES THE DESTRUCTION OF HIS CYCLOTRONS

by Yoshio Nishina

Bulletin of the Atomic Scientists, (1947) 3:6, 145-167

{*The following memorandum was made by Dr. Nishina as a contemporary record of the destruction of the cyclotrons in the Institute of Physical and Chemical Research in Tokyo, of which the author is Director. The account was brought back by Dr. Paul S. Henshaw, a member of the Atomic Bomb Casualty Commission, and is published here for the first time. Dr. Nishina is a well known nuclear physicist who has worked in the United States and in Copenhagen*.}

Under the date of October 15, 1945, request was filed with the SCAP for the permission to operate the cyclotrons in the Nishina Laboratory for the purpose of research in biology, medicine, chemistry and metallurgy. The permit was immediately granted, but it was later restricted to investigations only in the field of biology and medicine. While we were getting ready for work along the lines authorized, suddenly on November 20, the Laboratory was subjected to investigation by SCAP GHQ, and in the evening of November 22, a memorandum was transmitted through the Central Liaison Office, rescinding the previous authorizations and directing that the research be stopped. On November 24, at 8:30 A.M., Major O'Hearn, GHQ, gave us the order for the destruction of the two cyclotrons in the Laboratory, one

weighing 220 tons, and the other 28 tons. The destruction was accomplished in five full days, by Engineers of the 8th Army, working day and night.

In the afternoon of November 24, Nishina went to the Central Liaison Office, reporting the actual condition of the destruction of the cyclotrons, and, accompanied by Mr. Iguchi, Secretariat- General of the Office, presented himself at GHQ, where he met Colonel Rider and Major O'Hearn and inquired as to the reason for the destruction of the cyclotrons. The conversation did not reveal anything beyond that the destruction was by the order from the U. S. Government. Nishina asked specifically whether or not the opinions of American scientists were consulted by the Government concerning the destruction of the cyclotrons. To this question Major O'Hearn answered "Yes, of course," adding that Dr. Compton, who was in Japan recently, is stationed at Washington and his opinion is reflected in the Government action. As will be stated later we found subsequently that this information was incorrect.

CYCLOTRONS CANNOT PRODUCE A BOMB

Even today we absolutely fail to understand the reason for ordering the destruction of the cyclotrons. We surmise that cyclotrons might be considered as indispensable for the study or manufacture of atomic bombs. This, however, we know to be a mere "superstition" of uninformed laymen. A cyclotron may have been an important apparatus in the early studies on the creation of atomic bombs, but now that the atomic bomb has been invented, the manufacture of it no longer needs a cyclotron. It is only

necessary to have sufficient uranium to produce any number of atomic bombs without the aid of a cyclotron, and conversely, however many cyclotrons one may have, no atomic bomb can be manufactured without the uranium material. This fact is clearly revealed by the statements of American scientists engaged in the production of atomic bombs.

Now, it is a unified opinion of geologists and mineralogists that Japan does not produce sufficient uranium for the manufacture of an atomic bomb. Even without SCAP directive forbidding it, therefore, there is no possibility of the manufacture of atomic bombs in Japan. It should also be pointed out that the Japanese industrial power, even at the pre-war level, to say nothing of the conditions today, was altogether inadequate for the production of atomic bombs, even if there were enough uranium in Japan. This is an important point which should not be lost sight of in the consideration of the problem.

Our request to SCAP for the authorization to operate the cyclotrons was for the purpose of researches in biology and medicine, aiming at new discoveries which may greatly improve agriculture, forestry, animal husbandry, fishery and medical therapy. This has been the line of thought apparent even before the war, and we expected from such researches no inconsiderable contributions toward the stabilization of national living and improvement of national health in post-war Japan.

It was indeed for this reason that Dr. Compton, Head of the Scientific Intelligence Survey, GHQ, and other scientists associated with him, recommended to GHQ the authorization of the operation of the cyclotrons,

and the authorization granted in the first place. That not only this authorization would be rescinded but also the cyclotrons would be destroyed without adequate notice was almost beyond the limits of our credulity.

LARGER CYCLOTRON JUST COMPLETED

The cyclotrons in question were constructed through the tireless efforts of a few scores of scientists for a dozen or more years, and at the cost of no small amount of money. The larger cyclotron was just completed last year (1944). By the sad and untimely destruction, it was robbed of any chance to make contributions to science.

According to articles, however, appearing afterwards in *The Stars and Stripes* and *Time* magazine, the group of American scientists concerned in the manufacture of the atomic bomb at Oak Ridge, Tenn., declared the wrecking of the Japanese cyclotrons was "wanton and stupid to the point of constituting a crime against mankind," and was "as disreputable and ill considered as would be the burning of Japanese libraries or the smashing of Japanese printing presses," adding that months of continuous operation by the largest cyclotron the Japanese had would at most produce barely enough atomic bomb material to see, and that "it requires pounds of such material to make one bomb." They concluded that "men who cannot distinguish between the usefulness of a research machine and the military importance of a 16-inch gun have no place in positions of authority." Later, Harvard and Massachusetts Institute of Technology scientists sent letters to Secretary of War Patterson, denouncing the destruction of the Japanese cyclotrons.

President Compton of the Massachusetts Institute of Technology urged, in a strongly worded letter to Secretary of War Patterson, immediate dismissal of the officer who gave the order.

It is quite clear that the destruction of the cyclotron produced a considerable discussion among American scientists, and the information given to us by Major O'Hearn that the order for the destruction was given after consulting the opinions of American scientists must be regarded as untrue. According to what was reported by *The Stars and Stripes* and *Nippon Times* there were exchanges of notes between the U. S. Government and GHQ, making it clear that the cyclotrons were destroyed by an order from the War Department. *Nippon Times* printed a San Francisco broadcast stating that Secretary of War Patterson said that the destruction of the Japanese cyclotrons was a case of a mistake in the War Department.

YOSHIO NISHINA
Institute of Physical and
Chemical Research,
Komagome, Hongo, Tokyo
Dec. 20, 1945

P. S. Secretary of War Patterson later came to Japan and he was reported as having said at a press conference on about January 10, 1946, that he would take the responsibility for the destruction of the cyclotrons in Japan, adding that he did not see the message that was sent out, and that their mistake was that they did not consult with their scientific advisers.

*****

Isidor was the person who first told me about Nishina's 1947 BAS article (which I looked up and read after he told of its existence and importance). The following day he asked me about what I thought of the article. He listened politely as I listed out four or five points that I thought were disingenuous by Nishina. Isidor smiled then told me that the decision to destroy Nishina's cyclotrons were made at the highest levels within the authority of the Manhattan District and was in response to Nishina's disingenuous behavior when asked about Japan's wartime nuclear research. He also said that prior to the January 1946 statement Secretary of War Patterson had '*discussed the matter with "Oppie" and I and with General Groves and decided to 'lob the tennis ball' (Isidor's own words) back at Nishina, by being disingenuous in his own manner by stating "they did not consult with their scientific advisers," when in fact* he had. '

To expand the scope of the second investigation and partly in response to the 1947 Nishina memo in BAS, Isidor and "Oppie" made arrangements to bring Dr. Hideki Yukawa to America and from his arrival in America in September 1948 and during his year-long stay at the Princeton Institute for Advanced Studies. "Oppie" hosted Yukawa's visit to PIAS. There are very few pictures taken of Oppenheimer and Yukawa while he stayed at Princeton for obvious reasons – "Oppie" being the father of the US atomic bomb.

In his own words, Dr. Rabi explained to me that one of the main reasons why Dr Yukawa came to America was so that American scientists could debrief him regarding the Japanese wartime nuclear weapons program and in particular what went on within the IJN program in Konan (Hungnam) and elsewhere in Korea.

While there are very few pictures from 1949 of Oppenheimer and Yukawa, there are many pictures of Dr. Yukawa with Dr. Albert Einstein, the great show piece scholar at the Princeton Institute for Advanced Studies. One of the most famous is a still picture from a film released by the US Information Service in 1954 [5]

Fig. 3, Einstein, Yukawa, Wheeler and Bhabha

In this picture you have from left to right, physicists Albert Einstein, Hideki Yukawa, John Wheeler, and Homi Bhabha in conversation as they walk through Marquand Park in Princeton, New Jersey. Historians of nuclear physics will immediately point out that all four men in this picture played active roles in nuclear weapons programs.

Here is where the story of Yukawa's visit to America begins to become interesting.

With regards to Yukawa's visit to the PIAS in 1949, Isidor told me that Dr. Albert Einstein acted as a scientific consultant to the Manhattan District's S-50 Project (Fig. 4: Einstein consulting with the USN Department of Ordnance). [6] Isidor explained to me that the Manhattan District's S-50 Project undertook liquid thermal diffusion enrichment of ^{235}U under the supervision of the US Navy (the so called Clusius- Dickel process). [7]

Isidor stated that both the Japanese and Germans used this process to enrich ^{235}U during the war. The Clusius-Dickel process required copious amounts of superheated steam and is the reason why the US Navy took the lead in this project (US navy ships at the time used superheated steam boilers and turbines).

Almost immediately upon the announcement that he would be spending time in America, Japanese Nationalists had taken offense to Dr. Yukawa's visit to the United States. Dr. Yohio Nishina tried to dissuade Yukawa from traveling to America and tried to persuade him not to discuss the work that

was done behind closed doors in the Japanese wartime nuclear weapons program. Dr. Hideki understood the importance of his visit to America and did not bow under the intense pressure he and his family was put under.

Fig. 4: Einstein consulting with the USN Department of Ordnance

In his own words, Dr. Rabi explained to me that while Dr. Yukawa was in America, the FBI was tasked to provide special protection to him and his family. At PIAS Dr. Yukawa and his family were thought vulnerable. The decision to not extend Yukawa's stay past a year at the PIAS was partly predicated on the larger contingent of FBI agents available in New York City to provide special protection to Dr. Yukawa and his family.

While at the PIAS Dr. Yukawa was debriefed by Albert Einstein and "Oppie" on the liquid thermal diffusion enrichment of ^{235}U undertaken at Konan (Hungnam). Isidor told me that notes were kept of their discussions, but they are not in the public domain.

While at the PIAS and later at Columbia Dr. Yukawa was debriefed by "Oppie" and several other scientists, including Enrico Fermi and Hans Bethe, about the 'devices' the IJN had been working on. [NOTE THE PLURALS] Hans Bethe headed the Theoretical Division of Los Alamos during the Second World War. Given their limited resources Dr. Yukawa and his colleagues had come up with simple and workable designs. Hans Bethe reviewed the designs and declared them workable and even estimated yield (both the designs and yields are not in the public domain.). Perhaps they were gun-type designs for ^{233}U or ^{235}U?

From 1949 to 1954 Dr. Rabi hosted Dr. Yukawa's five year appointment at Columbia University. During this period Five Star General Dwight D. Eisenhower was President of Columbia University from June 1948 until January 19, 1953. On January 20th, 1953 Eisenhower would be sworn in as the 34th President of the United States.

During those five years of Yukawa's visit to Columbia Dr. Rabi was a senior member of the US Government's Atomic Energy Commission. During this same period the AEC undertook began development of the first generation of small yield tactical nuclear weapons (yields of 0.3 to 5 kt) that entered the US nuclear inventory in 1954.

Why then was Yukawa brought to America? You may wonder why the term 'brought' is used instead of invited. From 1945 to 1954 Japan was under the authority of the Occupying Powers (SCAP). When provided an 'invitation' the likes of which was given Dr. Hideki Yukawa in 1948, from Princeton and in particular J. R. Oppenheimer, it was less an invitation that a summons. The summons involved some rather sophisticated diplomacy.

It was understood in 1940's that Dr. Yoshio Nishina (1890-1951) was considered the godfather of modern Japanese Science. In the 1930's Dr. Hideki Yukawa had been one of Nishina's finest students.

During the Second World War Dr. Nishina had been one of the proponents of the Japanese atom bomb project and had work vigorously to bring the Japanese program to the very precipice of a test of a 'device' or design. Much of the work that Dr. Nishina and his colleagues had done is outlined in the 3rd edition of Mr. Robert Wilcox's book *Japan's Secret War* [8].

Dr. Hideki Yukawa was directly involved in the F-Go Japanese atom bomb project established by the Imperial Japanese Navy in 1943. He remained in Kyoto n University while doing this work. Much of their industrial efforts were centered near Konan (now Hungnam) in Korea. Much of the work that was done in Konan remains only partly known to Western observers, but is fully known by North Korea, Chinese and Russian (formerly Soviet) intelligence, counterintelligence and scientific organizations.

In his 2019 book Robert Wilcox argues that the beginnings and foundations of the North Korean nuclear weapons program were set down by the Japanese during the war. There is extensive *prima facie* evidence to support this contention. To add emphasis to his third edition of his book (the first edition was published in 1985) Mr. Wilcox made arrangements to have his revised and updated third edition of *Japan's Secret War* translated into Japanese and sold in Japan.

Trying to determine the facts about Japan's wartime nuclear weapons work when for over seven decades Japanese authority have actively tried to hide or obfuscate facts, is like trying to speculate what is at the center of a Matroyshka doll when all you see is the outside.

In the middle of one of our conversations, Isidor suddenly asked me a nuclear physics question:

"*How do the degrees of freedom relat to critical mass?*"

I thought about this question for perhaps fifteen seconds and said it might be a factor between two and three …

'*go on*' Isidor said.

I said it was perhaps closer to two than three.

'*go on …*' I said perhaps around 2 and a third?

He smiled. “*And how many degrees of freedom can one design into a ‘device?*”

I was about to say three when I realized the way he was looking at me that Isidor wanted me to be clever … and so I said **Four**.

The smile on his face said it all. “*And what is the fourth*?” …

The answer slipped out off my tongue before I really thought about it …”To implode and explode at the same time.”

He nodded …“and how much material would you need for four degrees?”

I asked him the type of fissile material.

“^{233}U “… I had not thought of using Uranium-233!

I took out my pocket calculator and calculated … between 2.25 and 2.5 Kg.

He nodded again. “And the yield …”

“Several kilotons … perhaps between 5 and 10 kt.”

That afternoon Isidor bought me lunch!

The '*fourth degree of freedom*' was one of the gems from the debriefing of Dr. Yukawa. Some of the insights shared by Dr. Yukawa would play a role in US designs of advanced nuclear weapons. Many of the two point detonation, light weight US nuclear weapons are a result of insights shared by Dr. Yukawa with Hans Bethe, and in turn Carson Mark.

A Nuclear Tsunami

Isidor smiled and said he heard that I had served in the Royal Canadian Navy as a naval reserve officer. I nodded. He paused for a moment and then sort of rolled his eyes behind his round glasses and asked me if I could keep a secret? I nodded.

He continued. "One of the reasons why the Imperial Japanese Navy was interested in nuclear weapons was because they knew the US navy would have to approach Japan to invade the Mainland, and it would be the IJN and not just the kamikaze that would have to do battle with the USN as they tried to invade Japan.

In 1945 when the US first debriefed Hideki, it was he who pointed out the best way to sink the attacking ships was to detonate a large blast underwater, causing the ships to crack open, flounder and sink. A nuclear tsunami!

My jaw instinctively dropped and I uttered "Crossroads?" And Isidor nodded, "yes when we did the Crossroads test in 1946, we found Yukawa was right! In 1948 he told us he was working on something special."

I guessed “a nuclear torpedo?”

“Do you know where the Imperial Japanese Navy’s torpedo works were?

I guessed again “Hiroshima?”

Isidor bought me lunch two days in a row …

{This is the first installment of several articles about the conversations I had with Isidor Rabi when I helped to host his visit to the Department of Physics.}

References:

[1] Dr. I. I. Rabi,

[2] Bloom, M.; Erdman, K., *The transverse Stern-Gerlach experiment, Canadian Journal of Physics*, (1962), 40(2): 179–193

[3] For six years I shared an office with Dr. Karl Erdman while we commercialized the TR series of nuclear medicine cyclotrons designed by TRIUMF and built in Richmond, BC by a Canadian high-technology company. Our competitors were General Electric and Siemens, two of the world’s largest technology companies. In the 1990’s Karl and I were the godfathers behind the success of this Canadian cyclotron company. Karl passed away in 2014.

[4] Dr. Fred Kaempffer was invited to UBC in 1949 to help expand the West’s understanding of the German wartime nuclear programs, in particular

those in the Soviet sphere of influence. One of Dr. Kaempffer's books would become a standard college book in the Soviet Union. Dr. Kaempffer will be the subject of articles under a separate cover.

[5] From the film – The Yukawa Story: https://archive.org/details/gov.archives.arc.53506

[6] Refer to: https://www.history.navy.mil/our-collections/photography/numerical-list-of-images/nara-series/80-g/80-G-40000/80-G-42919.html

Description: Albert Einstein in his study at Princeton University, Princeton, New Jersey, where he was engaged in research for the U.S. Navy, 24 July 1943. With him are Captain Geoffrey E. Sage, USN, Commanding Officer, Naval Training Station, Princeton (at left); and Lieutenant Commander Frederick L. Douthit, USNR, Executive Officer, Naval Training Station, Princeton. Official U.S. Navy Photograph, now in the collections of the National Archives.

[7] refer to: https://en.wikipedia.org/wiki/S-50_(Manhattan_Project)#:~:text=The%20S%2D50%20Project%20was,pursued%20by%20the%20Manhattan%20Project.

[8] Wilcox, R.., *Japan's Secret War*, Permuted Press, (2019) New York, Tokyo

German Scientists in the Soviet Atomic Project by Pavel Oleynikov

{Dr. Pavel Oleynikov has been a group leader at the Institute of Technical Physics of the Russian Federal Nuclear Center in Snezhinsk (Chelyabinsk-70), Russia.}

{Disclaimer from the Editor: Pavel Oleynikov statements of fact and analysis do not necessarily reflect the official views of any government, past or present, including those of Russia and the former Soviet Union.}

The fact that after World War II the Soviet Union took German scientists to work on new defense projects in that country has been fairly well documented. However, the role of German scientists in the advancement of the Soviet atomic weapons program is controversial. In the United States in the 1950s, Russians were portrayed as "retarded folk who depended mainly on a few captured German scientists for their achievements, if any."[3] Russians, for their part, vehemently deny all claims of the German origins of the Soviet bomb and wield in their defense the statement of Max Steenbeck (a German theorist who pioneered supercritical centrifuges for uranium enrichment in the USSR)[4] that "all talk that Germans have designed the bomb for the Soviets is nonsense."[5] The US intelligence community was able to make its own judgment on the subject when it debriefed German scientists and prisoners of war returning from the USSR in the 1950s, but it did not make public its evaluation.[6] This article attempts to resolve the controversy by drawing on both the stories

later told by these German scientists and the recently declassified Soviet accounts of the atomic project. It seeks to deter- mine the real extent to which German participation in the atomic weapons program changed the balance of nuclear power and influenced the course of the Cold War.

This article first addresses what the Soviets knew at the end of World War II about the German bomb pro- gram and then discusses their efforts to collect German technology, scientists and raw materials, particularly uranium, after the war. Next, it reviews the Soviets' use of German uranium and scientists in particular laboratories working on different aspects of atomic weapons development. It discusses the contributions and careers of several German scientists and their possible motivations for participating in the Soviet bomb program. The importance of the Germans' contributions was reflected in the awards and other acknowledgments they received from the Soviet government, including numerous Stalin Prizes in the late 1940s and early 1950s. Their contributions were particularly numerous in the area of uranium enrichment, especially on the technology of gaseous diffusion plants. After reviewing these developments, this article concludes with an evaluation of the political and historical significance of the use of German material and scientists. While the Soviets did not need the Germans' help to build an atomic weapon, their contributions certainly accelerated the Soviets' push to become a nuclear weapon state.

DID THE SOVIETS BELIEVE THE GERMANS HAD AN ATOMIC BOMB?

In the latter stages of the war in Europe, the US Army initiated efforts to investigate whether the advancing Allied troops could be threatened by a German radio- logical weapon.[7] However, the Soviets did not appear to share this concern. Whether because the Russians' intelligence worked better than that of their British or American counterparts,[8] or an atomic bomb was not believed feasible before the test in Alamogordo in July 1945, none of the published documents from the early stage of the Soviet atomic project (1943-1945) speaks of any such threat from Germany. However, there are indirect hints of possible Soviet concern.

The US forces in Europe conducted an extensive environmental sampling program to determine the location of possible atomic facilities. The recently declassified and published letters of Georgy Flerov to Igor Kurchatov, scientific director of the Soviet atomic project, show that the Russians also undertook such an investigation. Flerov, a nuclear scientist, was in Germany in May 1945 trying to find out whether the Germans had been able to make an atom bomb.

In a letter sent from Dresden circa May 21, 1945, Flerov wrote in an ambiguous manner to protect secrecy about his plans to use Geiger counters in the search:

> Today or tomorrow we are going to fly in the direction that you know. I am taking with me Dubovsky's instrument, but its sensitivity is, probably, too low. If we determine on site that there

> are objects of interest for examination and sensitivity of the instrument is the issue, I'll send you a cable.
>
> You will have to assign Stoljarenko or Davidenko (if he gets back by then) to this work. Instruct them to assemble the instrument in the lightweight option: powered from the mains by 220 volts.... Along with the instrument, let them pack the tables for finding the appropriate periods.…[9]

Unlike the US airborne Geiger counters, the Soviet counter was not portable because it was to be powered from 220-volt mains. Flerov was going to search for radioactive isotopes with a short half-life (what he refers to as "appropriate periods"). At the time, the only way to determine the presence of an isotope was to take consecutive measurements several days in a row and use special reference tables to calculate what the measurements revealed.

In another letter sent from Dresden on May 29, 1945, Flerov gave more clues that suggest he was looking for evidence on whether the Germans had conducted an atomic test. In this letter, Flerov discusses his desire to interview certain individuals being repatriated to the Soviet Union from Soviet-occupied Germany:

> ...the repatriation has begun. So far there are 10-15 thousand people a day crossing the demarcation line at three checkpoints. Later this number will rise to 50 thousand, until all former Soviet citizens (1-2 million) will be moved away from here. We have visited some of

the checkpoints, talked to former prisoners of war. Unfortunately, people from various locations are mixed in the most peculiar way …

Nevertheless, there should be organized systematic filtration of all arriving people based on their location: in such and such area, in such and such year, particularly because the respective [Soviet intelligence] agencies are con- ducting similar filtration in order to determine whom to send to what camp. [*Here Flerov made a footnote*: In each camp we shall have 1-2 people focusing exclusively on debriefing people brought from a specific location. After the first superficial questioning, the only people left will be those that we will speak to personally.] After selection, people are kept for several days until somebody from us arrives to speak to them.

Possibly, you can send somebody from the staff to help me. I think that as a result of such search we will be able to find what we need—a person who occasionally was there nearby, as there were a lot of escapees wandering through forests at the time. If successful, we will get objective confirmation of the fact, tantamount to as if we personally had been at that site. This must be done right here and right now, because afterwards all people crossing the border are dispersed through camps in Germany and then are transferred to the Soviet Union, and then even such an enthusiast as myself would question our ability to catch the right people….

> The second direction is connected to what I wrote you in the previous letter. In order to determine finally what was really tested there, we shall of course look after artificial, not natural radioactivity. Unfortunately, a lot of time has passed since, but I think that with [our instruments] we will be able to attain the required sensitivity.[10]

Obviously Flerov was not trying to find confirmation of reactor criticality because such an event does not create visual effects that could be observed by people in a forest. Therefore, Flerov must have thought that escapees could have witnessed something resembling an atomic bomb test, accompanied by a bang and a flash of light.

No documents have come to light that describe the results of Flerov's findings. What is known is that V.A. Stoljarenko (who was mentioned in the May 21 letter) indeed traveled to Germany, together with M.I. Pevzner and A.K. Krasin, some time after Flerov, probably to do the Geiger counter survey. Thus, the puzzle of whether Soviet physicists believed the Germans had developed an atomic bomb remains unsolved. However, it is clear that both the Soviets and Americans eagerly sought information from German scientists and their laboratory equipment.

RUSSIAN "ALSOS"

In 1944, alarmed by the uncertainty regarding Ger- man atomic developments, several agencies in the US government established a

specialized group—the ALSOS[11] mission—charged with finding and investigating atomic scientists and laboratories in the territories yet to be occupied by US forces.[12] A year later, the Soviets initiated a similar effort to search out and recover valuable installations, equipment, and scientists in Germany associated with atomic physics. The Soviet efforts were conducted on at least as large a scale as ALSOS; hence the use of the American title to refer to the Soviet effort, for which I have not been able to ascertain the Russian code name, if one existed.

The Russian ALSOS group borrowed a lot in its operations from "trophy brigades" established in the Soviet army. These looting teams were formed in January 1945 when the Soviet army finally broke the German defenses and opened the way to Germany. During their advance, Soviet troops encountered almost no Germans east of Stettin: most of the inhabitants had fled, leaving behind virtually all their possessions. In order to collect all the abandoned wealth, the Soviets formed special trophy brigades charged with requisitioning any property of value to the Soviet Union.[13]

The Soviets said the official justification for the trophy brigades came from agreements reached at the Yalta and Potsdam conferences in February and July 1945, respectively. However, the Soviet government did not generally base its actions on respect for international agreements, and the memoirs of Nikolai Dollezhal[14] suggest the decision to launch the brigades was made even before these conferences took place. In May 1945, Dollezhal was assigned the rank of colonel and sent to

Germany in order to “collect technical archives of enterprises of the chemical machine building industry.”[15] His identification stated that he acted under a decree from GOKO[16] of January 31, 1945, No. 7431. The papers he received stated that Dollezhal should be “granted unobstructed access for inspection of industrial sites.”[17]

While the trophy brigades were generally good at confiscating livestock and grain from the Germans, their treatment of elaborate pieces of machinery was too rough, often resulting in damage to the equipment or loss due to chaotic packaging. The Soviet leadership seemed to totally neglect the intellectual value of the German materials. According to Boris Chertok who, like Dollezhal, was promoted to the rank of colonel and sent to Germany in April 1945 to inspect missile navigation equipment:

> We had received guidelines and instructions that God knows who had come up with: during inspections of German plants and laboratories we should not be sidetracked by intellectual achievements, but first of all should make a list and compile an inventory of the types and quantities of machines, technological manufacturing equipment, and instrumentation. In terms of documentation and specialists, the matter was up to us and initiative was not punished.[18]

As described below, the Soviet atomic search groups demonstrated a different pattern: while they engaged in the removal of equipment, they

also removed documentation and scientists who were considered to be equal in value to, or even more valuable than, machines. The difference in agendas resulted from the fact that the atomic weapons program was managed and controlled by a specialized organization that was created inside the ubiquitous NKVD.[19]

Origin of the Atomic Search Teams

From a technological perspective, in 1945 the Soviet atomic bomb project was still "in the cradle." The first kilogram of metallic uranium had been manufactured in the fall of 1944, and the first cyclotron brought in pieces from Leningrad and reassembled in Moscow. There was a lot of intelligence on the US atomic bomb, but the information had yet to be tested.

At the outset of the Soviet project, the atomic scientists had been left to work on their own, with only the Soviet Academy of Sciences supervising them. However, the NKVD became involved in the Soviet atomic project at the same time that the uranium problem was first discussed in the USSR. One of the heads of the project was Avraamy Pavlovich Zavenyagin, who was also the head of the 9th Chief Directorate (*Glavnoje Upravlenije*—GU) of the NKVD. This choice of directorate was not a coincidence but a logical consequence of administrative functions of the 9th GU. As early as 1939,[20] the 9th Directorate already was a part of a larger Chief Directorate of Camps for Mining and Metallurgy Enterprises (GULGMP).[21] In 1940, when the need for uranium to use in weapons development was first

discussed in the Soviet Union, the emphasis was on surveying new uranium deposits and increasing production from existing mines. Naturally, this task fell into the realm of GULGMP, and thus that organization became involved in the uranium problem. Thus, in spring 1943, when the first atomic laboratory[22] was set up in Moscow (Laboratory No. 2, later known as LIPAN, now the Kurchatov Institute of Atomic Energy), its NKVD supervision was also assigned to the 9th Chief Directorate.[23]

Understandably, NKVD chief Lavrenty Beria and the head of the 9th Directorate, A.P. Zavenyagin,[24] were interested in exploiting what resources they could find in occupied countries. The first indication of their intentions to engage German scientists emerged in a decree of September 18, 1944, which established a specialized task force within the 9th Directorate and commissioned it to "support the work of German physicists invited to the USSR."[25] At that time, there had been only two German physicists working in the Soviet Union: Fritz Lange, who specialized in centrifuge separation first in Kharkov and then in Sverdlovsk in the laboratory of Isaak Kikoin, and F. Houtermanns, a theoretical physicist. According to the NKVD's plans, very soon they would be accompanied by many more.

In December 1944, another decree transferred the mining and processing of uranium from the Ministry of Ferrous Metals to the NKVD. At the same time, to provide scientific support to operations with uranium, a Moscow-based Institute NII-9 (now known as Bochvar All-Russia Institute of

Inorganic Materials, or Bochvar VNIINM) was created within the 9th Chief Directorate.[26] The first director of NII-9 was Victor Shevchenko, who also came from GULGMP. From 1943 until his appointment at NII-9, he had been the director of the Norilsk nickel mining combine, a facility that was infamous for the large number of convicts who had died during its construction.[27]

The next reported milestone in the Soviet atomic project occurred on March 23, 1945. On that day, during a meeting in Stalin's office, Beria suggested that specialized teams "grope in Germany and search there for novelties of German atomic technology and for its creators."[28] The next day Beria instructed the head of Laboratory No. 2, Academician Kurchatov, to "submit suggestions on formation of several search teams" to be sent to Germany, Austria, and Czechoslovakia. The same day Beria signed a secret directive putting his deputy Zavenyagin in charge of the operation to locate and deport to the Soviet Union German scientists privy to the German uranium project or who could be of use to the similar Soviet project. The operational issues were assigned to SMERSH military counterintelligence,[29] while two members of Laboratory No. 2—Lev Artsimovich and Yuli Khariton[30] —were to provide scientific guidance to the operation.[31]

The Austrian Bridgehead

The majority of German physical research institutes were situated in Berlin, and thus were inaccessible to the search teams until April 25,

1945, when the defense ring around Berlin was broken. However, the occupation of Austria and Vienna in particular, which had occurred prior to the occupation of Berlin, offered the first opportunity to evaluate the state of the “uranium project” in Germany. From past experiences, the Soviet authorities knew that Austrian institutes practiced a high level of science and could be involved in the uranium problem. They thought that the information from Austria could potentially be instrumental in the planned search activities in Germany. Until the fall of Berlin, Austrian institutes would be the only real information that the Soviet government would have on the German bomb project.

Thus, as soon as Soviet troops were established in Vienna, the NKVD leadership dispatched Vladimir Shevchenko, director of NII-9, and Igor Golovin, a leading scientist of Laboratory No. 2, to Austria. In their activities, Golovin and Shevchenko were assisted by the NKVD units in Vienna. As Kruglov[32] stated, “In April 1945, V.B. Shevchenko and representative of Laboratory No. 2 I.N. Golovin were sent to recently liberated by our troops Austria (Radium Institute) to find out the feasibility of removing equipment and various chemical reagents.”

Golovin and Shevchenko stayed in Vienna from April 13 to May 10, 1945.[33] During their stay, they conducted debriefings[34] of the scientists from the Radium Institute of the Vienna Academy of Science and from the Second Physical Institute of Vienna University, and provided Moscow with the first overview of organizations involved in the uranium project. Golovin’s report to Kurchatov was finally declassified and published in

the proceedings of the Kurchatov Institute in 1998.[35] In the report, Golovin identified the location of the three cyclotrons that were built in Germany during the war[36] and named the companies potentially engaged in production of metallic uranium: Auer Gesellschaft, I.G. Farbenindustrie, Treibacher Chemische Werke A, and Mauer A.G. Radium Chemische Industrie und Laboratorium. As both Golovin and Shevchenko would discover later when they moved to Germany to assist with the work there, their information was correct and Auer Gesellschaft was indeed the main producer of metallic uranium. In addition to documents, the group in Austria retrieved nearly 340 kilograms (kg) of metallic uranium.[37]

The achievements of the Vienna group would have been remarkable if they had not been dwarfed by what followed later in Berlin and its surroundings.

The Search for People and Equipment in Germany

Although Russian sources do not indicate Soviet leaders' expectations for the search mission, the scope of the missions indicates that for some time scientists' trips to Germany became more important than the research conducted in Russian laboratories. According to Heinemann-Grueder,[38] the total number of Soviet atomic scientists who went to Germany was close to 40. Given that the entire staff of the only atomic laboratory in the USSR at the time—Laboratory No. 2 in Moscow—numbered less than 100, inspections of Germany must have stopped almost any work in Moscow for approximately two months.

Evidently, Red Army regiments entering Berlin received instructions on the importance of scientific institutions and some scientists. On April 24, 1945, the head of the chemical laboratory of the 1st Ukrainian Front sent a dispatch describing his inspection of the Kaiser Wilhelm Institute of Physics and noting the absence there of the famous Otto Hahn.[39] By the time the main search group, headed by A.P. Zavenyagin, arrived in Berlin on the evening of May 3, all scientific institutions of interest were already guarded by Soviet forces. As Isaak Kikoin[40] recalled, "Obviously, the Army intelligence had such an intuition."[41]

In his memoirs,[42] Manfred von Ardenne wrote that for the sake of safety, his employees had posted on the Kaiser Wilhelm Institute's entrances signs in Russian[43] announcing that this was a scientific institute. However, the first contact with Soviet authorities occurred not due to that sign, but owing to a colleague. On April 27, Peter Adolf Thiessen, director of the Institute of Physical Chemistry and a friend of von Ardenne, arrived in a Russian armored car together with a major of the Soviet Army. The major had handed to von Ardenne a protective letter or "schutzbrief."[44] That major turned out to be a leading Soviet chemist.[45]

The main search group that arrived on May 3 included Zavenyagin, V.A. Makhnjov[46] (both had the rank of colonel generals of the NKVD), Kikoin, Lev Artsimovich, Yuli Khariton (dressed in NKVD colonel uniforms), and probably others.[47] If any group had arrived in Berlin ahead of this one, it must have included Georgy Flerov: as mentioned above, Kurchatov

Institute archives contain his letters to I.V. Kurchatov describing his search in Germany.[48] Nevertheless, I.K. Kikoin does not recall any meetings with a vanguard group; his initial inquiries were to army intelligence only.

Surprisingly, Kikoin does not recall any guidance for the trip from Russian foreign intelligence sources:

> On board the plane, when A.P. Zavenyagin for the first time announced to the group its goal, he approached I.K. Kikoin with a question about what German institutes, in principle, could be involved in the solution of the problems of interest.[49] Such a list was immediately compiled. First on this list was the Kaiser Wilhelm Institute of Physics, followed by Berlin University, Berlin Technical School, and others.[50]

Upon arrival in Berlin on May 3, the group occupied a whole building in Berlin-Friedrichschagen. The build- ing had armed guards and was big enough to house not only the team members, but also some of the German scientists recovered by the group.[51]

The first place the group went the next day, May 4, was to the Kaiser Wilhelm Institute of Physics. Its most recent director was Werner Heisenberg, the head of the German nuclear weapons program. The institute was empty: most of its equipment had been evacuated to Hoechingen in southern Germany (where it was captured by the US ALSOS team). Owing to some confusion, Ludwig Biweloga, the deputy

director of the institute, had never received the expected instructions to destroy the archives and so all documents in the institute fell intact into the hands of the Russian team. In its size and importance, this find was equivalent to German documents that were captured in Strasbourg by the US ALSOS team: it gave a complete description of the German uranium project and the accomplishments of the German team.[52] However, the level of atomic physics in the USSR by that time was, in at least some areas, more advanced than the information given in the German reports:

> Among the captured materials were Heisenberg's calculations of the critical sizes for a nuclear reactor. The corresponding formula—the so-called "three arctangents formula"—worked its way to Laboratory No. 3.[53] It was of little use to us: it was for fairly simple geometry while we were able to do numerically much more complex problems. Nevertheless, A.D. Galanin tried to reproduce it, and initially failed. Only several years later did he manage to prove it.[54]

According to Kikoin, although there was not much to take at the Institute of Physics, "some of the equipment remaining in the Kaiser Institute we had dismantled and sent to Moscow (electric switchboards, instruments). Several very naïve installations for isotope separation we also had sent to Moscow…."[55]

Despite Kikoin's low opinion of the equipment found, other sources state that it was good enough to be installed in a new building at his laboratory in Moscow:

> This building was completely refurbished within several months. The works received the best equipment, both indigenous and obtained under lend-lease from the US. … The laboratory rooms were outfitted with trophy equipment from the German Kaiser [Wilhelm] Institute selected by D.L. Simonenko—an employee of I.K. Kikoin.[56]

However thorough Russian Occupation Forces might have been at the Institute of Physics, they left enough traces for Sam Goudsmit, head of US ALSOS, to figure out the scope of work at the institute when he arrived there in late July after that sector of Berlin had been turned over to the Americans:[57]

> Our chief visit was, of course, to the now empty Kaiser Wilhelm Institute for Physics, where the uranium research had started in 1939. It was one of the few buildings wholly intact. …A US military officer at the site did not understand our interest in this building.
>
> "It's all empty," he said. "Everything, even switches and wiring, has been removed by the Russians. We found some junk which we dumped in the backyard. The sub-basement looks queer. It seems to have been a swimming pool. Go around and take a look."
>
> We inspected the place thoroughly. The backyard "junk" contained various pieces of equipment for nuclear physics as well as blocks of pressed uranium oxide. There were also some notebooks

indicating the type of research that had been going on. The sub-basement was the bomb proof bunker laboratory of which the Germans were so proud. It looked as if it had been excellently equipped. The “swimming pool” was the pit in which the pile had been constructed. Metal containers and frames for the arrangement of the uranium cubes were still standing near by.

The Russian search team’s next recorded accomplish- ment was its visit to the laboratory of Manfred von Ardenne in Berlin-Lichterfelds. Von Ardenne writes that on May 10, 1945, he was visited by Col. General Makhnjov accompanied by Kikoin, Artsimovich, Flerov, and Migulin. The visitors praised the research conducted at the laboratory and the complete and intact equipment: a new electronic microscope, registering mass-spectrometer, 60-ton cyclotron, and plasmaionic isotope separation installation. Right after Makhnjov arrived, armed guards were put around the laboratory. At the end of the conversation, Makhnjov suggested that von Ardenne continue his research in the Soviet Union. Von Ardenne agreed, putting it in writing in a memorandum.[58]

On May 19, von Ardenne had a meeting with Zavenyagin where the two discussed plans for the future.[59] Zavenyagin suggested that von Ardenne estab- lish a physical-technical institute in the Soviet Union. The meeting even progressed to a stage where the two agreed on the topics of future research. Those were:

- investigations of fine structures (electronic micros- copy, sweeping

electronic microscopy, development of microanalysis by means of electronic-microprobe);

- development of an indicator method for radioactive and stable isotopes (measurements in nuclear phys- ics, magnetic separation of isotopes, and mass-spectrometry); and
- topics of personal interest to von Ardenne.

On May 21, on a trip that he was told was for the purpose of signing the agreement on the creation of the institute, von Ardenne, together with his secretary Elsa Suchland, Alexander Bergengruen, and Wilhelm Menke, flew to the Soviet Union.[60] The first question of a female interpreter—"Haven't you brought your children with you?"—at the Vnukovo airfield in Moscow gave him a hunch about future events. Indeed, 22 days later, the rest of the institute's personnel joined von Ardenne in the "Silver Forest" spa near Moscow. As Gerda Langsdorff, von Ardenne's sister described it, 10 minutes after von Ardenne left for the airport, nearly 100 soldiers came to the laboratory and ordered everybody to pack. The soldiers filled about 750 boxes with equipment. When they ran out of the wood needed to pack large-size pieces (a 60-ton cyclotron, a one-million-volt power supply, a transformer from the highest-voltage electronic microscope), they resourcefully took the timber from a nearby bowling alley.[61]

It is very likely that von Ardenne or Peter Thiessen directed the Russian group to another scientist of interest, Gustav Hertz. Hertz, the head of the Siemens Research Lab and winner of the Nobel Prize in physics in 1925,

was of great interest to Kikoin and others because of his pioneering experiments in separation of neon isotopes by gaseous diffusion conducted in 1932. Gustav Hertz had been in close contact with von Ardenne and Peter Thiessen, and they had made a joint decision in 1944 to go to the USSR after the war.[62] Thus, when Heinz Barwich reached Berlin and tried to contact Hertz, he was not really surprised to discover that Hertz had already gone to the Soviet Union (despite the fact that he was nearly 60).[63] Probably, Peter Thiessen and Max Vollmer also had few hesitations in following the path of von Ardenne.

Other important goals of the search team were to se- cure uranium and uranium experts. Prior to World War II, the German company Auer Gesellschaft (or Auer Company) had used its experience in operations with rare earth metals and its large stock of "waste" uranium to take the lead in uranium production. Trying to avoid the raging war, its chief scientist Nikolaus Riehl[64] and some of his staff moved to a village west of Berlin (in hopes of being occupied by troops from either Great Britain or the United States). However, in mid-May, he was found there by two NKVD "colonels"—Lev Artsimovich and Georgy Flerov—assisted by Riehl's colleague, Karl Gunther Zimmer. As Riehl recalled, "the colonels requested that I join them for a 'few days' of discussions in Berlin. The few days lasted for 10 years."[65]

Riehl was very important to the Russian team. After initial discussions, the Russians did not allow him to return to his family; instead he was put in a guarded house (the headquarters of Zavenyagin's group) in

Berlin-Friedrichschagen. After living there for a week, Riehl was taken to the headquarters of the Auer Company in Berlin where the disassembly of all removable plant equipment and apparatus was well underway.[66] Before his departure for the Soviet Union, on two occasions the Russians took Riehl to the Auer factory in Oranienburg north of Berlin where "demounting and loading of everything that was not nailed down or riveted proceeded at full speed."[67] On June 9, 1945, Riehl, his family, and some of his staff were flown to Mos- cow. The fact that Zavenyagin's emissaries did not release Riehl after their original encounter and were ready to fly his entire group to the Soviet Union (while in von Ardenne's case the personnel arrived by train) shows how highly he was regarded. Moreover, Riehl spoke fluent Russian, having been born in St. Petersburg where his father was an engineer for Siemens.

As Kikoin later recalled of this period, "we fulfilled the task for the Government and invited for work in the USSR Professors Hertz, Manfred von Ardenne, and Thiessen. Another group of our scientists had engaged Professor Riehl, prominent specialist in uranium metal- lurgy, and other German scientists."[68]

An Offer They Could Not Decline

While the Soviet official history maintains that all German scientists went to the USSR willingly under contract, the real story is somewhat different. There were "volunteers," but there were many others who went under duress. Germany was full of rumors about atrocities that Russian

soldiers were committing against the civilian population: rape, murder, plunders. Could Nikolaus Riehl have slammed the door in the faces of Artsimovich and Flerov when the two came to take him to Berlin in May 1945? He probably could have, but he must also have been aware of the consequences in the form of soldiers coming to arrest him, and all the trouble this could create for him and his family.

The massive deportation began at 4:15 a.m. on October 21, 1946, left no place for freedom of choice. Every house was identified by authorities in advance, surrounded by soldiers, and then the owners were ordered to pack and proceed to a railway station where they were to board a train to the Soviet Union.

In terms of motives among the "volunteers," there was a very clear divide between the ideologists of German science such as Gustav Hertz and the average scientists and engineers. According to David Holloway, Gustav Hertz felt that he would be unable to compete on a par with American physicists, and he did not want to accept any charity.[69] Thus, he thought that he would be more appreciated and feel more comfortable in the Soviet Union.

In the case of Manfred von Ardenne and Peter Thiessen, they thought that their stay in Russia would be very short, just long enough to assist in setting up new research institutions near Moscow. They did not mind cooperating with the Russians, but the 10-year "sojourn" was certainly not something they could foresee.

For less well-to-do Germans, working for the Russians was really a "flight from hunger."[70] This motive was evident in the actions of the scientists who elected to work for the USSR, and for the United States under *Project Paperclip*. In fact, the scientists' relatives made comparisons, and often the United States came out behind in this "food race." As an example, the wife of one scientist reprimanded him for agreeing to work for a wage of $6 a day in the United States: "Do you think your adventure would be a success even if you were per- mitted to stay in the US under such sad conditions, whereas in Germany you could be a manager of a plant? Even with Russians, in fact even in Russia, it would be better than living the way we do."[71]

Many people believed Soviet promises of very short- term employment (one or two years only)[72] and did not mind making a "business trip" to eke out a living. Whether the Germans did not realize the inherent dangers or did not mind facing them, the Soviet authorities never had problems recruiting technical personnel. In general, the scientific community did not show much concern about moral issues. The issue of regular deliveries of food parcels to relatives in Germany was always of paramount importance for German groups in Russia. "Unfortunately, scientists are very much like prostitutes," remarked one German scientist who worked at Sukhumi when he was young, when asked about the motivations.

The Uranium Story

One of Germany's most important contributions to the Soviet bomb program was not scientific know-how, but uranium. The uranium confiscated from Germany greatly accelerated the pace of the Soviet atomic project. Despite all its efforts, the Soviet Union was catastrophically short of uranium for its atomic project. Even after some intensification of mining and the establishment of Mining Combine No. 6 (which reported to the 9th Chief Directorate of the NKVD), I.V. Kurchatov reported that the total amount of uranium available to Laboratory No. 2 by May 1945 was only seven tons of uranium oxide.[74] Heinemann-Grueder[75] has noted that in the spring of 1943, the USSR had bought limited amounts of uranium (10 kg of metallic uranium, and 300 kg of uranium oxide and nitrate) from the United States under the Lend Lease arrangement. Approval of this shipment of uranium to the USSR caused some controversy for US General Leslie Groves in the form of a congressional inquiry after the war, but it did not have a major effect on the Russian program:

> In January of that year [1943], the Lend Lease Administration had received an order from a Russian purchasing agent for over 450 pounds of uranium compounds. Several US companies offered to supply the Russians with this commodity, but uranium had been placed on the War Production Board's critical list. Therefore, the Russian order was, at first, turned down. Groves heard of these negotiations and intervened to honor the Russian request. He reasoned that to refuse would provide the Russians with inferential knowledge of the status of the United States' atomic program.

> More important, Groves hoped that the uranium shipment could be tracked to its destination, thus identifying the location of the Russian atomic research center.[76]

It was not a secret to the Russians that Germans had large amounts of uranium, including some acquired from the Belgian Congo. Unsatisfied with their "recruitment" mission, Khariton and Kikoin decided to start their own search for that uranium. Kikoin might have been more content if he had been aware that the group operating in Oranienburg had found, despite the heavy bombing of the plant by American aviation, nearly 100 tons of fairly pure uranium oxide with all technical specifications, contractual information, and descriptions of technology.[77] But, evidently, Khariton and Kikoin had departed on their search before they received this news (and this ultimately worked to their benefit). The story of their search was kept in the archives of the Institute of History of Science and Technology in Moscow and was made public only during a conference on the "History of the Soviet Atomic Project" (HISAP), held in 1996.[78]

Doing a random search through Berlin, Khariton and Kikoin came to a plant in the district of Grunau. Before the war, the plant had produced paint, but during the war, it was charged with producing gas masks. By mere chance, Kikoin talked to a young woman who worked as a bookkeeper, and she directed him to a small building where some experimentation with uranium took place. From inspecting the plant's records, Khariton and Kikoin learned that a company named "Rohes" had

shipped several hundred tons of uranium, but they could not at first locate the shipment's final destination.

Khariton and Kikoin continued to wander through Germany and, in Potsdam, they learned the name of the head of the Belgian office of Rohes. Through the Soviet military counterintelligence system (SMERSH), Kikoin requested that this person be arrested. Soon thereafter the Rohes manager was brought in front of the physicists. The manager admitted the existence of the uranium and the orders of Rohes to transfer the metal, but he refused to answer any questions that might reveal the actual location of the uranium. Kikoin returned the manager to SMERSH and asked that group to interrogate him. The next morning SMERSH representatives informed Kikoin that the manager had confessed the lo- cation: the uranium was stored in a town named Neustadt. There were about 20 towns with that name in Germany; 10 of them were in the Soviet zone of occupation.

After fruitless visits to the first nine towns, Kikoin and Khariton arrived at the last one, Neustadt am Glewe. The main target of their inspection was a leather tanning plant (which was already sending its products to the new owner—the USSR). Going through the plant's warehouse, the physicists saw nothing but barrels of lead used to tan the hides. Discouraged, they went to talk to the chief engineer of the plant. The engineer told Khariton and Kikoin that the company Hoffman und Moltzen had placed some goods in the plant's warehouse and these goods were in the barrels next to the barrels of lead. Upon examination these goods turned out to be

the uranium! This discovery led to more than 100 tons of uranium oxide being sent to Moscow.[79]

Overall, the Soviet's acquisition of uranium from Germany may have been the most important factor that accelerated (or made possible at all) the Soviet atomic program. As Kurchatov described it in 1946:

> In the middle of the last year, comrade Beria had sent to Germany a special group of co- workers from Laboratory No. 2 and NKVD headed by comrades Zavenyagin, Makhnjov, and Kikoin to search for uranium and raw materials containing uranium. As a result of their extensive work, the group has found and brought to the USSR 300 tons of uranium oxide and other uranium compounds. That fact has substantially changed the situation not only regarding the uranium-graphite pile, but also regarding all other uranium installations.[80]

This number, 300 tons of uranium oxide and its com- pounds, agrees with the estimates of findings at Oranienburg and Neustadt am Glewe.[81]

According to Khariton, Kurchatov believed that the uranium found in Germany during May to June 1945 saved the Soviet atomic project one year.[82] The uranium load of the first research reactor "F-1" in the USSR was 46 tons; the first load of uranium in the plutonium production reactor "A" built in the Urals in 1948 was 150 tons. Thus, it would be safe to conclude that the uranium seized in Germany prior to the fall of 1945 was

enough to run both reactors at the initial stage. Soviet reactors continued to bear German "birthmarks" even after the initial period: German materials dominated in their fuel. It is clear that Russia benefited from German materials, but it also benefited from the contributions of German scientists.

THE EVOLUTION OF THE GERMAN SCIENTIFIC GROUPS IN RUSSIA

Scholars of atomic history observe two distinct stages in the Soviet atomic project. The first one started in late 1942 when Kurchatov familiarized himself with more than 200 intelligence reports on almost every aspect of the US atomic bomb program and established Laboratory No. 2 of the Academy of Sciences on April 12, 1943. The second started after the nuclear explosions at Hiroshima and Nagasaki and was initiated by the decree of August 20, 1945, creating the Special Committee and the First Chief Directorate (*Pervoje Glavnoje Upravlenije*—PGU).

When the first German groups arrived in the Soviet Union, the atomic program was still in the first stage and thus relatively dormant. During the summer of 1945, the German groups spent their time on initial preparations and recreation. When von Ardenne arrived on May 22, 1945, he was placed at the "Silver Forest" spa near Moscow; his children and other employees arrived by train 22 days later. Riehl's group was placed at the so-called dacha "Osyora," which once had belonged to NKVD chief Yagoda and was later used as a residence for imprisoned Field

Marshal Friedrich von Paulus and his officers captured after the German surrender at Stalingrad. According to Riehl's memoirs, their groups were soon joined by Gustav Hertz, Leipzig nuclear physicist Robert Doepel, and distinguished physical chemist Max Vollmer.[83] Several days after Riehl's arrival, Gustav Hertz, Manfred von Ardenne, Max Vollmer and he, along with their wives, were invited by Russians to attend a ballet performance in Bolshoi Theater.[84] Based on the number of foreign guests at the performance, this event must have taken place on the eve or right after the famous Victory Parade in Moscow that was held on June 24, 1945. The Soviets apparently felt there were no urgent tasks for the Germans, and they could afford the luxury of taking them to Moscow to show off to British and American guests.

In the following weeks, the German groups slowly started preparations for future work in the Soviet Union. Von Ardenne reported a meeting at the end of June when he was offered a choice of places for his future institute: the Crimea, the Moscow region, or Georgia.[85] Von Ardenne selected Georgia with its subtropical climate. Rudenko reported a decision on June 24 to send Hertz's group (and von Ardenne's) to Georgia, but he did not mention any freedom of choice.[86]

Riehl and his co-workers started to travel around the country to select a place for the future uranium factory. Riehl traveled through central Russia and the Volga region. His co-worker Gunther Wirths was sent even farther afield to inspect a location near Krasnoyarsk in Siberia.[87]

This summer's tranquility abruptly ended with the bombings of Hiroshima and Nagasaki. Stalin was furious and demanded quick actions:

> Stalin was really enraged, that was the first time during the war that he lost control of himself…. What he perceived was the collapse of his dream of expansion of socialist revolution throughout all Europe, the dream that had seemed so real after the capitulation of Germany and was now invalidated by the "carelessness" of our atomic scientists with Kurchatov at the top.[88]

Soon after creation of the PGU and Special Committee,[89] leaders of the German teams were invited to a high-ranking meeting of a newly established committee. Both Riehl and von Ardenne recall it as the first meeting with Beria. As Riehl described it, "Beria had invited Hertz, Vollmer, von Ardenne and me to visit him in order to become acquainted with us. Each was separately invited into his office where perhaps 20 other individuals, mainly scientists and a minister, were seated."[90] Riehl did not find anything special about the meeting with Beria except that it was his first encounter with Igor Kurchatov.

Von Ardenne, however, described that meeting as a watershed in his work in Russia.[91] In his recollections, among the attendees were Kurchatov, Alikhanov, Galperin, Kikoin, Artsimovich, and Col. Generals Zavenyagin and Makhnjov.[92] Beria told von Ardenne that as the director of a new atomic institute, von Ardenne must build an atomic bomb for the Soviet Union. Von Ardenne realized that if he made the

actual bomb, he would never see his homeland again. Thus, von Ardenne suggested to Beria that his institute should work on uranium enrichment, while the Russians build the actual bomb. After half an hour internal discussion, the commission agreed to von Ardenne's proposal and suggested that he select and hire the people he needed for the task.[93]

The meeting with Beria was indeed a watershed for all the German groups. Soon after it, they departed to their new locations where they would spend the next five years. The most significant sites were Institutes "A" and "G" near Sukhumi, NII-9 in Moscow, Laboratory "V" in Obninsk, Plant 12 in Elektrostal, and Laboratory "B" in Sungul.

Von Ardenne and Institute "A"

According to von Ardenne, in late August 1945, Hertz, Vollmer, and he boarded the train that carried them south to Sukhumi, where von Ardenne was to set up his new institute. From the very beginning, von Ardenne asked that Hertz be provided a separate location. Such a location was found seven kilometers from Sukhumi—a sanatorium named Agudzery where an independent Institute "G" was founded for Hertz. Von Ardenne stayed in a place called Sinop, also in a building of a former sanatorium.

Von Ardenne's group arrived at Sukhumi with approximately 20 co-workers, but by the late 1940s, there were almost 300 Germans working at his institute (the total staff size is unknown).[94] Von Ardenne's group was the most active among the German groups in Russia in engaging

prisoners of war (POWs) in its work. For in- stance, Gernot Zippe, who became the head of all centrifuge experimental work in Steenbeck's group at Institute "A," came from the Krasnogorsk camp (the main camp for German POWs who had scientific de- grees) near Moscow. After major programs in Institute "A" had ended, however, most of the POWs were transferred back to camps where they received fairly rough treatment.[95]

Soon after the initial unloading and settling, A.P. Zavenyagin paid an inspection visit to Institutes "A" and "G." He saw German teams in disarray, as much of their original equipment never arrived (it went instead to the Kharkov Physical-Technical Institute), and confused about their roles in the new institutes. To improve the morale of the teams, Zavenyagin dispatched to Sukhumi a group of prominent Soviet physicists: Abram Ioffe, Lev Artsimovich, and Sergei Sobolev, who were full members of the Soviet Academy of Sciences, and Isaak Kikoin, who was a corresponding member at the time. Heinz Barwich got the impression that the visit was a sign of goodwill and desire to cooperate with the German groups.[96]

Soon the academicians were followed by Georgy Flerov. The meeting with Flerov was the closest that German teams came to the specifics of atomic bomb design. Von Ardenne recalled that Flerov clearly was looking for new ideas as he described the problem of plutonium predetonation and the requirements for fissile material purity and

enrichment.[97] Barwich, in turn, remarked that von Ardenne used the seminar to complain about the quality of the lab equipment.[98]

Serious scientific work began only at the end of 1945. After the organizational period, the topics assigned to Institute "A" (Sinop sanatorium) were:[99]

- electromagnetic separation of uranium isotopes (leader—Manfred von Ardenne);
- techniques for manufacturing porous barriers (leader—Peter Adolf Thiessen); and
- molecular techniques for separation of uranium iso- topes (leader—Max Steenbeck).

Based on Heinz Barwich's account, Thiessen must have arrived at Sukhumi some time in November. Thiessen's son Klaus stated that Soviet representatives promised his father they would create a new institute of physical chemistry near Moscow. However, contrary to his expectations, they took him to Sukhumi instead.[101]

Max Steenbeck probably arrived at Sukhumi at the same time as Thiessen. Steenbeck had been a director at Siemens works and in charge of the *Volkssturm*[102] militia at his plant. After his arrest, he was put into a concentration camp in Posnan.[103] After some time, Steenbeck wrote a letter to NKVD headquarters explaining his scientific background, and he was soon taken to Moscow, presumably by Artsimovich.[104] Barwich recalled that Steenbeck was recuperating at the dacha "Opalicha" in

November 1945, where he was receiving a cream diet to make him fit again. In Sukhumi, Steenbeck had double duty: he worked with Artsimovich on electromagnetic methods and also led independent research on new isotope separation techniques (using centrifuges).

Artsimovich was a staff member of the Kurchatov Institute in Moscow. Demonstrating Steenbeck's dual role, the personnel records of that institute show that on December 29, 1947, Max Wilhelm Steenbeck was appointed the head of sector 6 in scientific division "A," which was headed by Artsimovich. From April 16, 1949, to February 1, 1950, Steenbeck was listed as the head of Sector 26 of the Thermal Control Instruments Department—OPTK. The OPTK department was headed by Isaak Kikoin, the leader of the Russian uranium enrichment programs, and this transfer meant that during the late 1940s, Steenbeck's work on centrifuges was a higher priority than any other activity.[105] At its largest, Steenbeck's group included from 60 to 100 people, both Germans and Russians.

Gernot Zippe, who was put in charge of experiments in Steenbeck's group, arrived at Sukhumi in the summer of 1946 after his liberation from the Krasnogorsk camp. Zippe had a scientific degree from the Radium Institute in Vienna, thus his selection was natural. At the end of the war, Zippe was conscripted, took part in ra- dar and airplane research, then was captured and put into a camp next to Stalingrad. Later he was transferred to Krasnogorsk.

Von Ardenne noted that his institute also had a radio- biology laboratory that studied the effects of radioactivity on different environments.[106] The laboratory was probably headed by Wilhelm Menke, a biologist who had accompanied von Ardenne at the very beginning.[107]

Von Ardenne drove away some of his personnel. First he demoted his deputy Dr. Stuedel in a conflict over what material to use in an installation for electromagnetic separation of isotopes: Stuedel insisted on glass, while von Ardenne believed it must be metal. This happened in the initial period when von Ardenne was busy with organizational matters and had put Stuedel fully in charge of technical matters. Later Dr. Stuedel worked in Steenbeck's group on fully magnetic suspension of a centrifuge rotor.[108] Another "loss" was Dr. Bernhard, who went with von Ardenne to Leningrad and did not agree with von Ardenne regarding the reasons for their failures there. Bernhard had to transfer to Hertz's group because von Ardenne accused him of "breaking the unity of the German group."[109]

In the late 1940s, when the major work on uranium separation was completed, the number of staff at Institute "A" was reduced. In 1949, von Ardenne with a small group of co-workers went for a year to the Elektrosila plant in Leningrad to implement his ideas. The centrifuge research work was transferred to Leningrad in 1952. In 1949, Thiessen's group moved to Elekrostal to continue at Plant 12 their work on diffusion membranes. Institute "A" later served as the foundation for the Sukhumi Physical-Technical Institute.

Gustav Ludwig Hertz and Institute "G"

Gustav Hertz was probably the most eminent scientist among all the Germans who went to work in the Soviet Union. He received the Nobel Prize in physics in 1925 for his work with James Franck demonstrating the quantized nature of atomic excitation potentials.[110] In 1932, he conducted the first experiments into separation of neon isotopes by the diffusion method. At the time of his transfer to the Soviet Union, he was the head of Siemens Research Laboratory. According to Kikoin, he used Hertz as his model: in 1943, Kikoin went to Sverdlovsk where he tried to repeat Hertz's experiments with a slightly different set-up.[111]

Hertz arrived at Sukhumi together with von Ardenne and was given a separate institute—Institute "G" at Agudzery. Soon after this institute was established, the NKVD organized a trip to Berlin to hire new people for Institute "G." The trip occurred in November 1945.[112] The physical chemist Max Vollmer originally was included in Institute "G," but he soon left for Moscow to work on heavy water production at NII-9 (VNIINM).[113] To Hertz's surprise, the equipment that had been taken from his laboratory in Berlin never arrived in Sukhumi. The Russians explained that Soviet institutes, like the Kharkov Physical-Technical Institute, had a higher priority. Hertz became angry and threatened that the quality of research in his institute would correspond to the equipment provided and thus would be the physics of 1900. The situation soon improved.

The topics assigned to Institute "G" were:[114]

- separation of isotopes by diffusion in a flow of inert gas (leader—Gustav Hertz);
- •development of a condensation pump (leader— Muellenpford); and
- development of a theory of stability and control of a diffusion cascade (leader—Heinz Barwich).

By the end of 1945, Hertz and Barwich were given one new team member—a former convict, theoretical physicist Krutkov. Barwich and Krutkov then participated in the NKVD-announced competition for development of a diffusion cascade control theory.

Hertz's position was important enough to the Russians that he could request needed information from Soviet colleagues in other locations. For instance, D.L. Simonenko (who after 1945 was working in Kikoin's department) recalled that:

> at the request of director of Institute "G" Gustav Hertz, the encrypted cable from PGU ordered D.L. Simonenko to inform scientists at Institute "G" on the research into diffusion in the vapor counterflow environments. This information was delivered in the format of a seminar. In his turn, D.L. Simonenko was shown the work of G. Hertz on the cascade of molecular pumps, and the experimental instal- lation of M. Steenbeck used to investigate the issues of stability of a long thin-walled rotor.[115]

Despite von Ardenne's attempts to avoid direct com- petition with Hertz, in some subject areas, groups from Institute "G" achieved the results that were expected from and assigned to Institute "A." For instance, Werner Schuetze developed an operational mass-spectrometer that was put into production and used at the gaseous dif- fusion plant in Sverdlovsk-44. Another success was the work of Reinhold Reichmann who, parallel to Peter Thiessen, designed a technique for production of tubular ceramic filters. Reichmann died in 1948 and was posthumously awarded the Stalin Prize. In 1949, Reichmann's group was moved to the Moscow Combine of Hard Alloys (MKTS) to continue its work on dif- fusion membranes.

A member of Hertz team, Dr. Hans Gerhard Krueger, came to Institute "G" as a POW; he was found in the Krasnogorsk camp.[116] Originally Krueger was a mem- ber of Reichmann's team where he worked on the production aspects of "mouthpiece" tubular filters. In 1949, Krueger moved to Laboratory "V" in Obninsk, where he developed techniques for quantitative spectral analysis of reactor materials like beryllium oxide, sodium, bo- ron, lead, and bismuth. In an exception to the usual prohibition, Krueger was allowed to publish papers in Soviet journals during his "stint" in Russia.

After 1950, Hertz moved to Moscow where, together with Werner Schuetze, he started to work on analysis of lithium and purification of tritium.

According to the recollections of a former security escort at Agudzery, before Dr. Muellenpford arrived there for a final cooling-off period, he was the chief of a design bureau in Leningrad.[117] Evidently, this meant that the work of Muellenpford at Institute "G" was successful, and at the end of an initial period in 1949, it was considered important enough to be continued, probably at the Elektrosila plant in Leningrad.

Max Vollmer in NII-9

Max Vollmer came from the Technical Institute in Berlin-Scharlottenburg and spent eight years in the So- viet Union. Originally assigned to Hertz's Institute "G," together with Gustav Richter (a former employee of Hertz in Siemens Research Laboratory), he moved to NII-9 in Moscow to work on the design of an installation for production of heavy water. Vollmer worked with Dr. Victor Bayerl, who earlier had been engaged in oil distillation, and Paul Heulandt, a pioneer Luftwaffe re- search engineer. The original heavy water assignment came in late January 1946. In March 1946, Vollmer's group was put under the direction of Alexander Mikhailovich Rosen.

In 1946, Vollmer was given a design bureau in NII-9 created specially for the task of heavy water production.[118] Ministry of Atomic Energy (Minatom) archives have a record of Max Vollmer presenting his ideas to the PGU Scientific Council on August 22, 1946.[119]

Vollmer's group designed an installation for heavy water extraction based on the counterflow of ammonia. The installation was constructed at Norilsk. The design work was completed in 1948, and Vollmer and his group were transferred to Zinaida Yershova's group, which worked on plutonium extraction from fission products. Being a physicist, Gustav Richter proposed the idea of using mechanical separation techniques (centrifuges) for extraction of plutonium. Another institute tested the idea, but Richter was never told the results.

The heavy water installation appeared to be inefficient and had no immediate application to atomic bomb production because a decision had already been made to use reactors with graphite as the moderator rather than heavy water. Moreover, the plutonium extraction work came too late. Consequently, Vollmer's group did not produce any significant results, and he did not receive any awards.

Laboratory "V" (Obninsk)

Heinz Pose from Dresden had actually participated in the German uranium project. He accomplished the measurement of a neutron multiplication coefficient in an uranium-moderator system. Soviet officials somehow found him in Germany, and he accepted their invitation to work in the USSR, arriving with his family in Febru- ary 1946. His future laboratory's location was close to Malojaroslavets, a small city in the Moscow region, which prior to 1945 had been used as a camp for Spanish children.[120] The site was given the code-name "Malojaroslavets-10." After initial discussions,

it probably became clear that the future laboratory would be unable to recruit the necessary personnel in Russia. On March 5, 1946, Pose together with NKVD General Kravchenko and two other officers, returned to Germany to hire scientists for his laboratory. He spent six months in Germany procuring equipment and selecting new personnel. Pose signed contracts with his new employees that obligated them to work for him for two years.[121]

Records in Pose's diary[122] indicate that he procured equipment from Siemens, AEG, Zeiss, Schott Jena, and Mansfeld for his laboratory in Obninsk. Pose envisaged a large and extensive structure for his laboratory. He planned to have 16 laboratories in his institute. Originally the plans were to have the following eight laboratories and a nuclear chemistry laboratory:

1. Heinz Pose's lab for nuclear processes;
2. Werner Czulius's lab for uranium machines;
3. Walter Herrmann's lab for special issues of nuclear disintegration;
4. Westmayer's lab for systemic nuclear reactions;
5. Prof. Carl Friedrich Weiss's lab to study natural and artificial radioactivity;
6. Schmidt's lab to study methodologies for nuclear measurements;
7. Prof. Ernst Rexer's lab for applied nuclear physics; and
8. Hans Juergen von Oertzen's lab to study cyclotrons and high voltage.[123]

In 1947, Alexander Leipunski, an Ukrainian academician and scientific liaison of the 9th Chief Director- ate of the NKVD since 1946, was given a position in Laboratory "V." (Eventually Leipunski became the scientific director of the Institute of Power and Power Engineering [IPPE] that was founded on the basis of Laboratory "V" in Obninsk.)

Records of the Reactor Section of the Scientific Coun- cil of PGU from May 1947 identify the goals for Laboratory "V": "Assign to comrade A.I. Leipunski and Laboratory 'V,' together with Laboratory No. 2, development of reactors with beryllium as a moderator, and submit their practical proposals on this subject in the first half of 1948."[124]

This large-scale work was performed mainly by Ger- man scientists. It included research in the following areas:

- physical, mechanical, chemical, and nuclear-physi- cal properties of beryllium and beryllium oxide;
- analysis of chemical contaminants and methods for reducing their amount;
- calculations of the [neutron] multiplying systems with a beryllium moderator;
- preparation and performance of experiments on the transport of neutrons in beryllium environments; and
- development of various instrumentation and tech- niques needed in research.[125]

Later Heinz Pose's Laboratory "V" was put in charge of "development of a nuclear reactor with gas coolant, 500-MW[126] power, using enriched uranium as its fuel, and beryllium oxide as the neutron moderator." [127] Kruglov also reports that Laboratory "V" was engaged in studies of radiation biology and separation of radioisotopes similar to Laboratory "B" in Sungul. [128]

Until 1948, the site was open, and there were no restrictions on outside trips. But, in 1948, the site was surrounded by a fence, and thereafter members of the colony could leave only with escorts.[129] At this time, two scientists in Pose's group, Dr. Karl-Heinrich Riewe and Dr. Renger, declared a "strike"; they apparently hoped that the NKVD would find nothing else for them to do and send them back to Germany. It is not clear whether their protest was caused by the introduction of the fence or the fact that the two-year contracts they had signed in 1946 had expired and they still were not allowed to return home. Their protest, however, had very grave consequences. Riewe and Renger were imprisoned, and accused of being the ring-leaders of a sabotage.[130] Riewe received a sentence of 25 years in labor camps and essentially disappeared.[131]

In 1952, most of the Germans left Obninsk for Sukhumi where they lived until their return to Germany in 1955. Heinz Pose continued his employment at Laboratory "V" until 1955, when he moved to the Laboratory of Nuclear Problems (now the Joint Institute of Atomic Research) in Dubna. In 1959, Pose returned to Eastern Germany.

Plant 12 (Elektrostal)

Nikolaus Riehl described[132] how, after his arrival in the Soviet Union, he and Zavenyagin spent some time surveying different sites for the future uranium plant. The news of the Hiroshima bombing sped up their search, and the decision was made to place the uranium plant in Elektrostal (near Noginsk, formerly Bogorodsk) using the facilities of a former munitions plant that had been decommissioned at the end of World War II. Ironically, the Bogorodsk factory had been used by the Germans as a munitions factory prior to World War I; in the 1930s, the Germans built steel works at the same place.

All the equipment originally installed at the plant came from Riehl's home company, Auer Gesellschaft:

> All that we had were the materials that we had stripped from our company and other places and brought to the Soviet Union. Even then, much was missing as a result of having been lost or damaged in transport. Missing for ex- ample, was a large vacuum oven. I went to Zavenyagin, the Atomic Minister mentioned earlier, and wailed. He determined from a tele- phone conversation that it had inadvertently been shipped to Krasnoyarsk in mid-Siberia by mistake. A cargo plane was sent, and we retrieved it two days later. On one occasion Zavenyagin visited us in the tiny munitions laboratory where we were first located. He asked the staff of

> Russian workmen, who en- circled him respectfully, from where the vari- ous pieces of equipment had come. The response was uniform. Each had been liber- ated as war tribute from Germany. Just as this exercise was finished, a rat suddenly ran by. He said harshly, “That clearly is ours.”[133]

Riehl’s group in Elektrostal was relatively small, and only two POWs later joined it. There were 14 German “specialists” in Elektrostal, or, counting all dependents, a total of 31 Germans in town.[134] On one occasion, Riehl tried to improve the living conditions of some of his former colleagues from Berlin-Buch. For example, after Riehl had learned that radiochemist Hans Born and chemist Karl Gunther Zimmer were in the Krasnogorsk camp, he told Zavenyagin that he needed them. The Soviet authorities brought them to Elektrostal, but there was almost no work for them there. To everybody’s benefit, Zimmer and Born left Elektrostal for Laboratory “B” in Sungul in December 1947.[135]

Although some sources call it unprecedented,[136] Riehl routinely attended scientific councils of the First Chief Directorate, PGU. Riehl was a member of the “uranium mining and production” section of the PGU council and took part in such decisions as:

- the annual plan for NII-9 for 1949 (on February 22, 1946, i.e., three years in advance, as was typical in the Soviet planned economy);
- conclusions about the technological scheme of Plant 12 (jointly with Academician V.N. Khlopin and Gunther Wirths, on March 14,

1946); and

- briefings on the requirements for purity of chemicals used at Plant 12 (also on March 14, 1946).

As there was no experience with uranium production in the Soviet Union in 1945, Riehl and his group used a technology they had used in Germany. Gunther Wirths took the lead in wet-chemistry processes (i.e., extraction of uranium from the ore), while Dr. Ortmann was in charge of melting and casting operations. There were three important upgrades in the technology. The first involved the replacement of the low-throughput fractional crystallization method with a superior ether technology; this resulted in a substantial increase of the uranium oxide available for the reduction operation and final casting. Riehl learned information about this technology from a Russian translation of Henry D. Smyth's *Atomic Energy for Military Purposes*, published in the United States in August 1945. Two members of Riehl's team, Gunther Wirths and Herbert Thieme, quickly worked out the technology—"we can do anything Americans can."[138] They procured all the equipment for the ether process from the Hermsdorf ceramic factory in Thuringia. The ether process was ready to run by June 1946.[139]

The second improvement involved changes in the reduction process used to make metallic uranium out of powdered uranium oxide. At the suggestion of a scientist from NII-9,[140] Riehl agreed to use uranium tetrafluoride instead of uranium oxide. Because the scientist did not describe the source of his information, Riehl believed that the data were

obtained by intelligence. There are, however, dissenting opinions,[141] which state that the first experiments with uranium tetrafluoride were carried out in the laboratory of the State Institute of Rare Metals (GIREDMET) in 1944 and that the technology was completely ready for implementation in 1946. Gunther Wirths and the chief engineer of the plant, Golovanov, jointly worked out the application of tetrafluoride technology. Their first experiments were conducted in 1946, and the technology was accepted as the main one in 1947.[142]

Both the oxide and tetrafluoride technology used metallic calcium for chemical reduction. For some time, the USSR lacked a plant to produce metallic calcium, and therefore from November 1945 until September 1946,[143] this important metal was carried by planes from the I.G. Farbenindustrie “Nord” factory in the German city of Bitterfeld. During that period, a group of scientists and workers from Plant 12 traveled to the Nord factory to learn the process and to dismantle equipment. In November 1946, the first experimental shop at Elektrostal produced the first portion of calcium.[144] However, local production could not support all the needs of Soviet industry, and the Soviets continued to import German calcium until a large facility was commissioned in 1950.[145]

The third upgrade in technology involved the vacuum oven used for melting and casting uranium. Initially, the group used the vacuum oven brought from Germany. Very soon, however, the Russians provided a much better, high-frequency, induction-type vacuum oven AJaKS from Plant 627 (that plant specialized in the casting of ferrous metals and magnets).[146]

In 1950, the German team was no longer needed in Elektrostal. Production was going smoothly, and Riehl wanted to leave. At first, the PGU leadership offered him the new task of extracting uranium from Estonian shales.[147] This "earth-processing" job did not appeal to Riehl, and he opted to go elsewhere. A.P. Zavenyagin offered Riehl a position in Laboratory "B" at Sungul to work on the problems of radiobiology and the extraction of radioisotopes. After initial inspection of this site, Riehl, along with Ortmann and two POWs on their team—Baroni and Schmidt—left for Sungul in 1950. Herbert Thieme moved to Obninsk.[148]

Laboratory "B" (Sungul/Snezhinsk)

The smallest among all the laboratories in the 9th Directorate of the NKVD, Laboratory "B" in the Urals, received probably the most publicity in the Soviet Union because of Daniil Granin's book *Zubr* published on the wave of *perestroika* in 1987.[149] This book described the life of Nikolai Timofeyev-Resovsky. He had spent nearly 20 years working in the Kaiser Wilhelm Institute in Berlin-Buch, before being arrested in Berlin by Soviet troops sometime in September 1945,[150] put into a labor camp in Kazakhstan, and then taken to Sungul. The book mentioned his work in Sungul with German scientists brought from Berlin-Buch. Laboratory "B" never dealt with production or high-priority technologies. Instead, it appears to have been a place to provide some useful employment for the people who, for various reasons, ended up in the NKVD system. This was

true for Nikolaus Riehl, Karl Zimmer, and Hans Born, who elected to leave Elektrostal[151] for Sungul.

Advocates for the leading role of Timofeyev- Resovsky tend to believe that the whole Sungul facility was created for him and his genetics research. This theory is supported by the fact that Timofeyev-Resovsky was among the first "NKVD" scientists brought to Sungul. But given the NKVD's relative neglect of this facility, a more plausible hypothesis is that Karl Zimmer (or someone else) in Germany suggested to the leaders of the Russian atomic project that they set up the radiobiology laboratory.[152] Possibly, Soviet leaders saw a role for the laboratory researching the effects of and protection from the radiological weapons that were under active development until 1954 in the USSR.[153]

Whatever the reasons for establishing this laboratory, work there focused on two areas: radiobiology and radiochemistry. The radiobiology department was headed by Timofeyev-Resovsky, and the radiochemistry department by S.A. Voznesenky, who had come from the Glazov, Udmurtia uranium plant. Owing to their proximity to the Mayak radiochemical (plutonium) plant, scientists in Sungul could work with very high doses of radiation. Veterans of the laboratory also recall large quantities of uranium ore stored in the basement of the laboratory and allegedly brought from Germany.

At its busiest time, Laboratory "B" had nearly 300 employees (that is why Zavenyagin and Riehl referred to it as an "institute"). According to

the archives of the city of Snezhinsk (formerly Chelyabinsk-70), which inherited the Sungul laboratory's property, in the early 1950s there were 15 German employees in the laboratory.

Laboratory "B" did not produce any results that won Stalin Prizes or other awards for its scientists. After the German contingent left the laboratory in 1953, it continued its operations at a much slower pace until it was assimilated into a new nuclear weapons design institute NII-1011 (now known as the Institute of Technical Physics). While the actual products of the lab's radiobiology research are unclear, Kruglov in his account of Minatom history, described the accomplishments of the radio- chemistry group: they developed the first technology in the USSR for the isolation of such fission by-products as strontium-90, cesium-137, zirconium-65, and the technology to remove these isotopes from chemical compounds.

ACCOMPLISHMENTS OF THE GERMAN GROUPS

The indicators of "success" for intellectual work depend on the type of society in question. In societies governed by meritocracy, scientific success is measured by the number of publications, the number of citations to those publications, and the awards a scientist receives from peers. In an authoritarian society, accomplishments are often measured by the level of administrative position reached and the government awards received.

Due to security restrictions imposed on their work, German scientists could hardly expect peer review of their progress. Following traditional

practices, they requested permission (which was denied) to be published in Soviet journals: the Kurchatov Institute archives contain a Ministry of Interior (MVD) memorandum to Beria asking if German physicists could publish their work under pseudonyms.[155] In such circumstances, the only available measures for success are the government awards received by the scientists.

The most prestigious award in the 1940s and 1950s was the Stalin Prize (later renamed the “State Prize”). It was conferred in three degrees and was associated with a very large financial bonus: the first degree prize carried with it 150,000 rubles, the second degree prize conferred 100,000 rubles, and the third merited 50,000 rubles. The prize was given to honor a prominent technological achievement. Frequently when a certain technology was recognized, the financial bonus had to be split among its several co-creators. With a few exceptions, Stalin Prizes were awarded after a prominent event, such as a successful nuclear test in the case of the atomic program. Thus, the shower of Stalin Prizes in 1949 (after the first atomic test) fell mostly on people who participated in weapons design and plutonium production (including uranium fuel), while the prizes for 1951 (after the second and third tests) included scientists from the enriched uranium program (because the third test used parts made of uranium-235).

The case of Gustav Hertz, Heinz Barwich, and their Russian colleague Prof. Krutkow exemplifies the process. The three worked mostly on uranium diffusion cascades control theory. In late 1951, after the successful test of a uranium-containing bomb, their contribution (the

control theory) was awarded a Stalin Prize of the second degree. The 100,000 ruble bonus was split among them as follows: Hertz and Barwich received 40,000 rubles each, while Krutkow received only 20,000 rubles.[156]

The list of Stalin Prize recipients in the atomic program was classified. The full list of recipients of the 1949 Stalin Prize was first published in the HISAP-96 proceedings.[157] The following descriptions of the accomplishments of German scientists rely on the authoritarian society model: they cover the cases where either German scientists occupied leading positions in various projects, or where their work received recognition in the form of the Stalin Prize.

Reactor Design

In the late 1940s, the Soviets considered the development of a beryllium-moderated reactor, the project assigned to Heinz Pose's group in Obninsk, to be very important. They hoped that the neutron multiplication reaction that takes place in beryllium could substantially improve the neutron balance in a reactor and even support an expanding chain reaction. However, the original idea did not live up to expectations. In the course of research at Laboratory "V," it was discovered that the neutron capture in beryllium matches the multiplication of neutrons, meaning the net outcome is zero.[158]

After the initial goal of the atomic project—a successful test in August 1949—was accomplished, the First Chief Directorate (PGU) initiated a review of the feasibility of building nuclear power installations for large ships, submarines, and civilian power production. Laboratory "V" proposed a concept that included a beryllium moderator, helium gas cooling, and a fuel made of enriched uranium. The Scientific Council of PGU, by its decree of November 29, 1949, instructed Laboratory "B" to continue development of helium-cooled reactors.[159]

Because the majority of the German employees left Obninsk in 1952, they were not able to see the results of their original work. Only Heinz Pose continued his work in Obninsk until 1955.

Electromagnetic Installations (Electronic Microscope, Mass Spectrometer, Calutron)

Manfred von Ardenne, before he became involved in atomic physics, was famous in Germany for his development of vacuum tubes for radars and other electromagnetic devices.[160] At the time of Makhnjov's and Kikoin's inspection on May 10, 1945, von Ardenne already had an electronic microscope in his laboratory. Therefore, he was not surprised when in 1946 he was asked to design a new, table-top electronic microscope. He was able to quickly deliver the drawings. In January 1947, the Chief of the Site[161] presented von Ardenne with the State Prize (a purse full of money) for his microscope work.[162]

As mentioned above, sometimes Institute “G,” headed by Gustav Hertz, was more successful than von Ardenne in designing instruments. This was the case with the mass spectrometer. Dr. Werner Schuetze from Institute “G” designed a mass spectrometer that received unanimous approval from the Government Commission[163] and was immediately installed at the future gaseous diffusion plant at Sverdlovsk-44. In 1949, Schuetze was awarded a Stalin Prize of the second class for his work.[164]

Ironically, it was Schuetze’s mass spectroscope that continued to prove that von Ardenne’s efforts in electromagnetic separation (calutron) did not deliver the expected results.[165] While in 1950 von Ardenne was still continuing his research into separation of isotopes at the Elektrosila plant in Leningrad, the SU-20 installation designed by Lev Artsimovich (commissioned in 1948) was successfully enriching uranium. Ultimately, von Ardenne managed to resolve the problems, which had to do with the ion source and confinement of plasma.

At the end of his career in the Soviet Union, von Ardenne received one more award—a Stalin Prize of the first class. He used this money to buy land for his future private institute in East Germany.[166] According to the agreement that von Ardenne had reached with the Soviet authorities soon after his arrival in the Soviet Union, the equipment brought from his laboratory in Berlin-Lichterfelds was not considered a reparation to the USSR and he could take it back (which he success- fully did in 1954).

Heavy Water Installations

The story of heavy water production in the USSR is one of the few in the atomic project where agency rivalry was especially visible and counterproductive. The clash between the NKVD and the Ministry of Chemical Industry is reflected even in Minatom's official history. According to Kruglov and Rosen, German involvement in the heavy water projects began in 1946, when Max Vollmer proposed a new method of heavy water production and was transferred from Institute "G" to NII-9 in Moscow. By then, the USSR already had a few facilities doing the job. One, situated in Central Asia, in Chirchik, Uzbekistan, produced heavy water by means of electrolysis in cascades; the other, in Tula, used hydrosulfates (e.g., H_2S). The Chirchik facility had existed prior to 1945 and was totally indigenous. The facility in Tula, with a high degree of certainty, can be attributed to the Germans' work. A 1955 US Central Intelligence Agency (CIA) report gave the following account:

> Following the war the Soviets showed considerable interest in German research in the production of heavy water. The principal German pilot plant was located in the Leuna Works at Merseburg. In October 1945, under the aus- pices of the MVD, a number of individuals specializing in heavy water were assembled at Leuna under the leadership of Dr. Herold. This group drafted the preliminary plans of an H_2S- H_2O exchange plant capable of producing five tons of heavy water per year. Upon the completion of these plans, the Leuna group was evacuated to the USSR on October 21, 1946. Herold and his top men were housed in the small town of Babushkin near Moscow. These people worked at the Institute of Physical

> Chemistry named after L.Ya. Karpov until mid-1948, when they were sent to Rubezhnoye in the Ukraine. It is believed that at this time [1955] the group's connection with the Soviet heavy water project was terminated and that it was detailed to do engineering work on the construction of the Lisichansk Nitrogen Plant. Whether or not the Soviets constructed the H S-H O exchange plant is unknown.[167]

The CIA's statement that the evacuation on October 21, 1946, followed the successful completion of the de- sign was probably inaccurate. That day was the date of the largest enforced deportation of scientists, mostly working on the Soviet-funded rocket projects, from East Germany to the USSR.[168]

Vollmer's involvement followed a parallel track. He happened to propose deuterium separation using ammo- nia rectification. The same process had been independently proposed by Adrian Rosen approximately half a year earlier in the State Institute of Nitrogen Industry— GIAP.[169] Through the efforts of Zavenyagin, Max Vollmer and Victor Karl Bayerl were transferred to Moscow to work with Rosen. Because few people were available to work, the progress was slow. Finally, Zavenyagin prepared a governmental order, approved on March 18, 1946,[170] which transferred the heavy water project to NII-9—an NKVD institute with more chemists. This move angered Mikhail Pervukhin, the minister of chemical industry, who forbade construction of the heavy water plant at any site belonging to

the Ministry of Chemical Industry. This put a stop to plans to erect the plant in the Moscow region, at the Novomoskovsk nitrogen combine.

Forced to identify another location, the only suitable site that Zavenyagin could find for the heavy water facility was in Norilsk, at a nickel mining combine where he once worked. The single advantage of this remote location was the availability of cold water even in summer. Because carrying clean liquid ammonia by trains was prohibitively costly, the facility's designers decided to use the locally generated ammonia that was a by-product of coke production. This decision proved to be fatal.

When, in the fall of 1952, the ammonia rectification unit was finally phased in after delays,[171] it was discovered that contaminated ammonia resulted in a massive generation of foam. This foam obstructed the normal flow of liquids in the isotope exchange unit. A group of consultants was flown in to solve the problem. The group included Igor Petrjanov-Sokolov, the leading Soviet chemist on heavy water issues, and Max Vollmer, among others. After several months, the group was able to improve the performance of the facility and return home. However, the installation in Norilsk turned out to be a worthless investment: its operation was irregular and expensive. In 1962, seven years after the Germans departed, an order was made to shut down and disassemble the facility.[172]

Membranes for Gaseous Diffusion Machines

The Soviet Union’s research into isotope separation methods experienced some abrupt shifts, in part due to information gained through foreign intelligence. In the late 1930s and early 1940s, Soviet scientists seemed to support the use of centrifuge separation. Fritz Lange, a German émigré, worked at the Kharkov Physical-Technical Institute on centrifuge separation in 1940. Yuli Khariton also was among the advocates of the centrifuge approach.[173]

However, in 1942, after the Soviet government had asked Igor Kurchatov to write a review of intelligence materials on the US atomic project, the Soviets began to emphasize gaseous diffusion technology. They trusted the technology because it worked in the United States. In addition, they had very detailed information (including blueprints of the Oak Ridge plant) on gaseous diffusion technology acquired by Soviet intelligence.[174]

In gaseous diffusion, uranium in the form of a gas (uranium hexaflouride, UF_6) is passed through a series of porous membrane barriers. Because the fissile isotope uranium-235 is slightly lighter than uranium-238, it passes more rapidly through the membrane. After a sufficiently large number of passes, the uranium can be enriched to a high enough percentage of uranium-235 to be used in a weapon. One of the important problems in the design of a gaseous diffusion machine is the membrane. Gaseous diffusion will work only in a set-up where the size of a membrane pore is commensurate to (or is only a fraction of) the mean free path (the average distance a molecule moves without hitting another molecule) of the isotope of interest. The mean free path depends on the gas

pressure and increases as the pressure grows smaller. Thus, to make diffusion work when membranes cannot be made with small enough pores, a ma- chine must be designed that will operate at lower gas pressures. This requires the compressors to work harder to pump the same amount of material (gas volume is inversely proportional to pressure). Therefore, the smaller the pore size is, the higher the gas pressure is, and the more efficient is the gaseous diffusion plant.

German scientists substantially contributed to the Soviet's efforts to design a membrane for gaseous dif- fusion technology. In early 1946, Laboratory No. 2 (now the Kurchatov Institute) issued a classified request for a proposal to design a *flat* membrane.[175] Fifteen organizations submitted their designs. The Moscow Combine of Hard Alloys (MKTS) won the competition. In their design, nickel powder was poured into a mold atop a vibrating table. After some vibration to compact the powder and level its surface, the tray was baked in an oven until the powder was partially melted and formed a ceramic-like porous plate. After the addition of some strengthening elements, the plate was turned into a membrane ready for use. After tests, however, it was found that nearly 10 percent of all pores in such a membrane would let any molecule go through (i.e., were too big to perform the separation function), and that the operating pressure of such membranes was 20 to 30 millimeters (mm) of mercury (Hg) column, a feature that would lead to large losses of electric power, a waste of compressor power, and extremely high requirements on the air-tightness of the machinery.

German groups in Institutes “A” and “G” joined the competition some time in 1947 and started to work on designs for tubular membranes that were expected to be more efficient. Peter Thiessen’s group in Institute “A” focused on a lattice-type filter: a nickel lattice with 10,000 holes per square centimeter was covered by fine- grain nickel carbonyl and baked in an oven. Afterwards, the mesh was bent and welded into tubes. It was discovered that Soviet industry at the time was unable to duct nickel wire finely enough to make the required lattice. For some time the necessary wire and the lattice were ordered from Berlin.[176] Although Peter Thiessen later received a Stalin Prize for his work in the area of gaseous diffusion, it is unlikely that he personally invented the membrane. Rudenko and Kruglov mention that a Dr. Schtuze received a Stalin Prize in 1948 for design of a diffusion membrane.[177]

Both German and Russian sources state that Thiessen’s design had an unpredictable nature and was more appropriate for a lab bench than mass production; Zavenyagin derided his process as “artisanship.”[178] Nickel carbonyl powder was manually sprayed on flat lattices and then these were pressed by rolls. Given the huge surface area of diffusion membranes, manual spraying was a real drawback. The need to do it manually disappeared only in 1952 when a way to automate this tedious process was found.[179]

The German group in Institute “G” was headed by a former pharmacist, Reinhold Reichmann. He was working on a mouthpiece type of

membrane that could be extruded and would require no welding. Reichmann first experimented with copper and silver, then with nickel.

Reichmann's solution clearly had its roots in his previous occupation—he mixed nickel with dimethylgloxin and then with a mild pain killer, clove pinks oil.[180] The mixture was then extruded and baked. Reichmann died soon after his discovery, and a Stalin Prize was awarded to him posthumously in 1948.[181]

Both types of tubular filters developed by the German teams, after tests in Laboratory No. 2, were approved for use in second-generation diffusion machines.[182] It was decided to send Thiessen's group to Plant No. 12 in Elektrostal, and Reichmann's group (headed then by V.N. Yeremin and his wife) to the MKTS. Beginning in 1949, these two plants started to manufacture all filters for diffusion machines.

The new filters could be used at pressures up to 50 mm of Hg column. This meant that—without any changes in the gaseous diffusion plant's design—its capacity could be increased by a factor of 2 or 2.5, provided its compressors could work at higher pressures. Tubular filters were first used in the second-generation diffusion machines that formed the basis of the second diffusion plant, the D-3 plant at Sverdlovsk-44.[183] In 1953, Zavenyagin decided that the production of diffusion filters should be transferred to the Sverdlovsk-44 site in the Urals.[184]

Activating the Diffusion Plant

At the NKVD's instruction, in late 1945 Hertz and his colleagues in Institute "G" started development of a control theory for diffusion cascades. Cascades connect a large number of individual diffusion stages in which the isotope of interest is gradually separated from the initial feed gas. Hertz and Barwich were calculating requirements for pumps in the diffusion cascades, and also acceptable losses of uranium hexaflouride due to corrosion in the cascades. Also, from theoretical calculations they determined percolation (i.e., a statistical description of a particle's path through a filter) in a membrane and the diameter of pores in a filter. In 1946, Barwich worked out a theory of natural stability of separation cascades that led to a reduction in the number of compressors in the design of the enrichment plant and a reduction in the time the material stayed inside the plant.

In a diffusion plant, because the depleted gas still contains some uranium-235, it is not discarded but is rather fed back into the previous cascade. The enrichment level and gas pressure of the depleted material must be the same as that of the incoming gas in the previous enrichment cascade. If the pressure differentials between cas- cades are set wrong, the whole flow may invert its direction and no enriched product will reach the output. The process control problem had to be solved theoretically first. The Soviets had engaged their best mathematicians and theoreticians to solve this problem (among them was Academician S.L. Sobolev).

In 1948, the first gaseous diffusion plant in the USSR, D-1, was put into operation. It contained 6,200 diffusion machines installed in 56 enrichment cascades.[185] The D-1 plant had problems. [186] Ball-bearings in compressors were made too precisely, without proper tolerances for thermal expansion, and quickly failed. Infusions of uranium hexafluoride into the plant were not leading to any product at the output. The situation was catastrophic. Among the luminaries brought in to help solve the problem in October 1948 were Gustav Hertz, Heinz Barwich, and Peter Thiessen.[187] Because they did not know the official name of the secret facility, the trio christened it "Kefirstadt" (now Sverdlovsk-44 or Novouralsk) after the "kefir" milk drink that they were given there every day for more than a month.[188]

The D-1 plant's greatest problem was corrosion. In the presence of water, uranium hexafluoride turned into tetrafluoride and stuck to the surfaces of the cascades as a powder. To fix this, all workshops were put under air hoods where they were supplied with dehumidified air. Also, nearly 5,000 leaky compressors were replaced in the plant. Peter Thiessen, with his co-worker from Sukhumi Prof. Karzhavin, proposed using a heated fluorine-air mixture to passivate (i.e., give a protective coating to) all internal surfaces of the cascades to reduce future corrosion by tetrafluoride.[189]

Even after these problems were solved, the plant was unable to deliver the expected product, 90-percent enriched uranium-235. The maximum enrichment that could be reached even after two full runs through the

cascades was 75 percent. The further enrichment to 90 percent could only be reached by using an SU-20 calutron developed by Artsimovich.[190]

The first awards for uranium enrichment technologies were presented in 1951 after the successful tests of a nuclear bomb containing uranium (the earlier Soviet test in 1949 involved a plutonium bomb).[191] Thiessen was awarded a first class Stalin Prize, while Hertz, Barwich, and their Russian colleague Krutkow received a second class award.[192]

Production of Metallic Uranium

As noted earlier, the real boost to the Soviet atomic project came from German uranium stocks and the scientists who could work with them. According to Kruglov, almost two years after Elektrostal began its operations, it was still using the uranium brought in 1945 from Germany by the ALSOS search teams:

> The raw uranium— unprocessed uranium powder—that the first uranium blocks were made of was the trophy one. In the first half of 1947, a workshop for processing of im- ported rich uranium ores was put into opera- tion at Plant No. 12. The lower-content national ores starting from 1947 were pro- cessed at Plant No. 906 in Dneprodzerdzhinsk.[193]

Another indicator of how long Riehl's group used German uranium is the case of boron contamination[194] discovered in uranium blocks in November

1946. Contamination of uranium at Plant No. 12 happened all the time: uranium attracted boron from the enamel coatings of process vessels as well as from the graphite cladding of the molds where it was cast. In November 1946, the boron concentration exceeded the limits by a factor of nearly 100. Everything was under investigation: German calcium, graphite crucibles for uranium melting, and graphite molds for casting. It appeared that the culprit was the Moscow Graphite Plant, which had shipped a batch of cladding made of non-chlorinated graphite to Plant No. 12.[195] Riehl, however, knowing that German uranium was being processed, saw a different solution:

> A possible solution to the excess boron finally occurred to me and eased the mood. I remembered that the uranium oxide that we had produced at Auer Company had been stored in a shed that previously contained boric acid, which was required in the production of luminescent materials. Back in Germany, the zealously active service officers of the NKVD had scraped together all the uranium oxide on the floor of the shed along with some dirt.[196]

The work of Nikolaus Riehl and his colleagues at Elektrostal, especially in 1945 and 1946, had a direct impact on the production of the first plutonium bomb.

Therefore, it is not surprising that he received one of the first batch of Stalin Prizes granted in November 1949. The only two employees of Plant No. 12 who were awarded the title “Hero of the Socialist Labor”

were Nikolaus Riehl and the director of the plant, Anatoly N. Kallistov.[197] Both also received first class Stalin Prizes. Gunther Wirths, Herbert Thieme, and Yuri Golovanov, the chief engineer of the plant, received second class Stalin Prizes.[198] Wirths and Thieme might have received their awards for their work in implementation of the ether process.[199] Overall, the German scientists at Elektrostal acted primarily as scientific advisors. The plant grew quickly and by 1950 had nearly 10,000 workers, so there was no need for Germans to actually handle the bomb material. Instead they developed ideas to improve the technological process.

The Centrifuge Story

Soviet scientists had originally sought to develop centrifuge technology for enrichment but then abandoned it in favor of gaseous diffusion. Fritz Lange conducted the first experiments with centrifuges in 1940. According to the records of Daniil Simonenko, a member of Kikoin's group, Lange's centrifuge was a mammoth structure:

> The centrifuge rotor was a steel cylinder 250 mm in diameter, 600-mm long, with walls 5- mm thick…. Along the rotor axis there was a big shaft (70 mm in diameter) which was in- stalled horizontally, in massive columns on special bearings…. When assembled, the centrifuge was a bulky structure with all parts weighing slightly less than a ton.[200]

Because the future applications for Lange's centrifuge were unclear, all centrifuge research was suspended. However, centrifuge work was revived after Max Steenbeck at Sinop demonstrated the feasibility of a light-weight, inexpensive centrifuge. According to Gernot Zippe,[201] who joined Steenbeck's group in the summer of 1946 from the Krasnogorsk POW camp, the first experiments with centrifuges began at the end of 1946. Steenbeck's group had more than 60 staff members. Steenbeck developed all the theoretical background, while Zippe became the head of experimentation.

At first, Steenbeck investigated the feasibility of centrifuge enrichment using rubber hoses instead of foilwound tubes, and worked on the theory of gas flow inside a rotating cylinder. Based on his findings, Steenbeck proposed to the PGU Scientific Council in Moscow building an apparatus for enriching uranium to weapons grade in one step. He envisaged the apparatus as a 10-meter long, thin-walled centrifuge; this concept was called a "rotating chimney."[202] The Scientific Council agreed to try Steenbeck's approach, probably in early 1947.[203]

Having started with a two-meter-long cylinder, Steenbeck and Zippe eventually reduced the design of the tube down to 25-cm long, 25-mm in diameter, with a wall thickness of only 0.15 mm. Zippe recalled a visit of a professor from Moscow who came to check their progress.[204] Based on other accounts, this professor could have been Daniil Simonenko, Isaak Kikoin's deputy:

> By March 1947 approximately 25 samples of enriched uranium hexafluoride were obtained. Measurement of isotopic composition of samples was performed at Institutes “A” and “G” where D.L. Simonenko was sent on a business trip…. D.L. Simonenko was shown the work of G. Hertz on making a cascade of molecular pumps, and the experimental installation of M. Steenbeck used in investigations of the stability of a long thin-walled rotor. The installation already had needle support[205] at the bottom. The idea to use such support, ac- cording to M. Steenbeck, emerged during de-sign of an instrument for measurement of the degree of separation in the electromagnetic enrichment method.[206]

After a successful demonstration, the concept received further support. The expectations rose, as did the pres- sure on the team, and “on March 1, 1948, Steenbeck came back from Moscow with the message: if we can-not show a successful experiment on uranium separation before April 1, the centrifuge development would be finished.”[207]

To meet this stringent deadline, the group pursued two solutions. The first, suggested by Zippe, consisted of making the centrifuge as simple as possible; the second, pursued by Dr. Steudel, was a technique for magnetic suspension of the spinning rotor. The operation of both designs was successfully demonstrated on March 21; the Project was saved.

When, in 1950, Steenbeck heard from Lev Artsimovich about the problems with the gaseous diffusion plant and its inability to reach the

required 90-per- cent enrichment, "Steenbeck decided to write directly to the boss of the Soviet nuclear enterprise, Marshal Beria. He proposed to build a centrifuge enrichment factory on top of a diffusion plant to get the necessary enrichment."[209] The letter remained unanswered, so Steenbeck wrote a second one. Then he "was summoned to an audience." His meeting with Beria must have taken place in the middle of 1950, as Steenbeck requested that his people be given contracts identifying the end date for their work. In the case of Gernot Zippe, his contract was signed on November 29, 1950.[210]

In 1952, the centrifuge technology was developed enough to be transferred to Elektrosila, the serial production plant in Leningrad. This plant and its design bureau were already involved in manufacturing gaseous diffusion machines. According to Sinjov,[211] the German design appeared to be impractical. The centrifuge was supercritical, measured three meters in length, consisted of nine sections, and used the thermal mechanism of counterflow (evaporation/condensation). Sinjov says that his team made all the remaining design refinements. However, Zippe reports that he was ordered to Leningrad in the second half of 1952.[212] With his Soviet colleagues, Zippe experimented for two more years with new short centrifuges until his transfer to a transition camp in Kiev for a two-year stay.[213] The first prototype centrifuge plant was built in Sverdlovsk-44 in 1957, while the full-scale facility was commissioned in the 1960s.

The sequel of this story was a nightmare for Sinjov because Zippe allegedly stole the credit for his work on the centrifuge. In 1956, after his

return to Germany, Zippe continued his work on the mechanics of high-speed rotations (he worked on spindles for the textile industry that, to a certain extent, also were fast spinning rotors). After attending a conference on centrifuge enrichment in 1957, he realized the advanced nature of the results that Steenbeck's group had reached in Russia, and filed for a patent covering the short-bowl centrifuge technology. He acted with the consent of the Soviet representative to the International Atomic Energy Agency in Vienna, V.S. Yemeljanov.[214] Having received the news from Europe, American scientists mounted a campaign to get the funds to invite Zippe to repeat his Soviet short-bowl experiments at the University of Virginia.[215] For various reasons, on August 1, 1960, at the request of the United States, all centrifuge research in Germany became classified.[216] In his 1991 book, Sinjov angrily accused Zippe of borrowing the ideas and explained that the Soviets did not protest the centrifuge patent in order to "preserve in secrecy for 30 years the existence in the USSR of a technology superior to any- thing else."[217]

THE CADRE OR THE MATERIAL?

Speaking to graduates of the Military Academy in 1938, Joseph Stalin coined a phrase "Cadres decide everything." This phrase epitomized the epoch when the Soviets believed that through an act of will, the Soviet people could overcome any technological obstacles or lack of resources. Reflecting this bias, when evaluating the contribution of German scientists to the Soviet atomic project, Soviet officials claimed that the USSR used

only a few, mostly second-rate scientists and, therefore, the overall German contribution was insignificant.[218]

The above descriptions, however, indicate that those officials, intentionally or not, ignored the importance of material confiscated from satellite states. As discussed above, the uranium the USSR acquired from Germany in 1945 alone was enough to power its first experimental reactor F-1 (which had an uranium fuel load of 50 tons and went critical on December 25, 1946) and the first plutonium-generating reactor "A" (which had an uranium fuel load of 150 tons and went critical on June 10, 1948). German uranium alone was extremely important to the Soviet project.

There were other benefits to the Soviet bomb project, smaller in size but still very important. In 1945, the USSR lacked the technologies and materials crucial for developing an atomic bomb:

The previous two years [prior to 1945] the experimentalists were literally living as paupers. Even the simplest milli-ammeter was moved from one laboratory to another, and had to be borrowed for a day or two; a vacuum pump was a rare treasure; due to the absence of furniture, people were sitting on tarp-covered boxes left over from the rare deliveries of equipment at the makeshift nailed tables they made themselves. The war trophies allowed us to begin full-fledged experiments. The library received complete sets of much- needed scientific magazines, compendiums, and books.[219]

The Soviet atomic project rested not only on steel and uranium. Instruments and electronics also were essential. Practically every electronic component that the Soviet Union used for nearly five years after 1945 came from Germany. A physicist from the Institute of Physical Chemistry who led the development of instrumentation for atomic tests recalled:

> In 1947-1949 there were very few indigenous radio components existing in the country. Therefore, the instruments manufactured for the first test of the atomic bomb were mainly assembled from the trophy radio components: resistors, capacitors, relays, motors, transformer iron; some vacuum tubes were manufactured in Germany. Even wires, vinyl tubes, and assembly fixtures that we used were German. [The voltage converter] for the ISV instrument, “Exacta” cameras for photographing images from oscilloscopes were also of German production. …
>
> With time the lab started to receive instrumentation, mostly of non-Russian make. Thus, the measurement bridges (“Brown ”), vacuum tube-based voltmeters (“Jackson”), and high- voltage electrostatic voltmeters were American, the voltammeters (“multizets”)— German, the electrostatic voltmeters (“Zierold”)— Czech. The group of P.V. Kevlishvili received the high-end, according to standards of the time, cathode ray tube oscilloscope “Dumont-248.” The Russian-made instruments started to arrive in the 1950s.[220]

According to the officers at the Semipalatinsk test site, even the programmable control board at the site was built entirely of German components and "had two hundred relays manufactured at a V-2 missile factory."[221]

The Soviet Union even lacked electro-mechanical calculators (i.e., primitive computers) before it imported them in large numbers from Germany as a replacement for mechanical calculators and slide rules. The two most popular models were "Mercedes" and "Rheinmetall Borsig." Their names can be found almost in every description of the atomic calculations of the late 1940s and early 1950s.[222] Table 1 summarizes some of the most visible German material contributions.

In addition to the clearly identifiable foreign "endowments," there were several cases of indirect German influence. Because the involvement of German scientists and industry in projects in the USSR was so widespread, oftentimes managers of the atomic program probably did not recognize the origin of the contributions. Aviation, electronics, optics, shipbuilding, all benefited from Ger- man contacts and, in turn, worked for the overall benefit of the Soviet Union.

The transfer of German technology certainly accelerated the progress of the Soviet atomic bomb program. However, even without the input of German material the Soviet Union would have become a nuclear power. It would have continued its practice of buying turn-key technologies

from the West (not only from Germany, but also from the United States) as it had done in the 1930s.

RAW URANIUM MINING	
Mills for uranium mines	Were acquired in competition with other ministries, specifically, the Ministry of Construction which wanted to use the mills for cement production.
URANIUM FUEL PRODUCTION	
Uranium ore	For nearly two years German and Czech ores were the only sources Russians had; the imported uranium was enough to jump-start the reactor industry and defy US assessments that the USSR would need 10 years to make its first bomb.
Ceramic equipment for ether-based extraction	Was bought from a plant in Thuringia; no Russian manufacturing capability existed.
Equipment for fractional extraction	Copied and dismantled equipment taken from Nord Works of I.G. Farbenindustrie.
Metallic calcium for reduction melting	Was bought from I.G. Farbenindustrie plant at Bitterfeld.
URANIUM ENRICHMENT BY DIFFUSION	
Nickel wire for filters	Until 1950, this wire was entirely German-made.
INSTRUMENTATION FOR WEAPONS DESIGN	
Oscilloscopes	In the three years after 1945, German oscilloscopes were dominant in Soviet laboratories.
Cameras	The high-speed cameras for imaging of atomic explosion evolution were replicas of US "Fortax" cameras and Zeiss cameras.
Electronic components	The Russians inherited and ran at full capacity the V-2 components factories.

Table 1: German Materials Used in the Soviet Atomic Project

Even after May 1945, when the Soviet push for global dominance became particularly clear, Laboratory No. 2 managed to buy different instrumentation from the United States for a total of $250,000.[223] Using such a procurement path, the Soviets would have taken longer to develop a bomb (probably within the US intelligence community's estimate of 10 years), but they would have been successful.

The Limits on German Scientific Contributions

While the Germans aided the Soviet bomb program, they did not design the Soviet bomb. Instead, the Soviets followed US blueprints. Even Petr Kapitsa, who in 1945 advocated an indigenous approach in weapons development, was not able to win over the government.[224] The Soviets had US drawings for technologies that were known to have worked, and their goal was to duplicate those, potentially inefficient, designs. There- fore, it is safe to conclude that the first Soviet atom bomb never could have been the "German bomb," because it already was the "American bomb."

German participation in the Russian bomb program in the 1940s was also limited by security considerations and domestic politics. During the late 1940s, the Soviets curtailed the pro-Western attitudes fostered by alliances during World War II and began a new govern- mental campaign targeted against contacts with the Western world. This campaign of trials and "purges" was championed by Andrei Zhdanov, a leading Soviet

government official and Stalin's son-in-law at the time, and was targeted against "ideological servility towards the bourgeois West."

Prior to the campaign, German science and technology had been widely recognized and respected. In the early 1940s, Georgy Flerov, a co-worker of Kurchatov, thought Germany would be the first country to develop an atomic bomb:

At that time it seemed that if anybody would succeed in making a nuclear bomb, it would not be the Americans, not the British, not the French, but the Germans. They had excellent chemistry and technology for production of metallic uranium; they were doing experiments on separating isotopes by centrifuges and had brilliant physicists. Moreover, the Germans had heavy water and stocks of uranium. And the predominant feeling was that the Germans could build this thing.[225]

Things started to change after 1947. Although Ger- man scientists did not directly experience the new attitudes, they were able to see some signs of them. Riehl described a visit Beria paid to Elektrostal in 1948 that was prompted by a perceived preference being given to the German scientists:

> The Soviet scientists, particularly those in the Institutes of the Academy of Sciences, were accusing Zavenyagin of preferring to obtain advice from the Germans instead of from them. This reaction was not unreasonable, for there were excellent scientists in their organizations. This complaint made it possible for Zavenyagin to

arrange to show Beria that he had a very productive German group under his control and this justified his actions.[226]

Under the new political guidelines, what started as "an attitude of admiration for German technological achievements coupled with a desire to learn, which is the expression of one of the basic themes of Russian his- tory" was followed by "a rejection of Western influence and an insistence on Russian self-sufficiency and even pre-eminence which is, unfortunately, an equally basic historic theme."[227]

In such a situation, even if the German scientists could, through their knowledge and skills, have made the bomb, they were not allowed to build it. Their role always remained "on tap, not on top."

CONCLUSION

It is hard to fully explore the German contributions to the Soviet atomic project without performing a detailed examination of the whole Soviet atom bomb effort.

What is clear from the available evidence is that Ger- man involvement had several very important implications for the Soviet Union and the world:

- German resources jump-started the Soviet program and saved up to

five years of time. If not for this time, the USSR could hardly have been as aggressive as it was in seeking global dominance. Very likely, the USSR could not have wielded its influence in Asia, and the whole course of regional history (e.g., the Korean War) would have been different.

- German scientists, although not always of the high- est caliber, were diligent in doing their jobs and pro- vided important on-site training for their Soviet colleagues. Many former workers of Laboratory "V" (Obninsk) and Laboratory "B" recalled the educational benefits of working hand-in-hand with the more experienced and knowledgeable German scientists.
- Participation of German scientists in the develop- ment of new uranium enrichment methods revolution- ized the whole uranium fuel industry. The work of Max Steenbeck and Gernot Zippe shaped the Euro- pean and Japanese enrichment plants, and was used by several later proliferators (e.g., Pakistan and Iraq) as well.

In sum, although the Soviets would have eventually developed nuclear weapons on their own, they benefited considerably from German technology, expertise, and raw materials. The German contributions undoubtedly accelerated the program by several years and enhanced the Soviets' stature on the world stage. An accurate and complete history of the Soviet bomb program must acknowledge the importance of the Germans' contribution

References:

1) I wish to express my gratitude to Professor Wolf Haefele for opening the whole subject and guiding me through it; Dr. William Potter for encouraging me to persevere; Dr. Gernot Zippe for providing documents and per- sonal accounts; Dr. Mark Walker for offering the generous opportunity to familiarize myself with his unpublished interviews; Dr. Klaus Thiessen for candid discussions and patience; Dr. Eberhard Born for personal exposure to the history; Dr. Frederick Seitz for generous support; and many others in the United States who lent their friendly assistance.

2) See Clarence G. Lasby, *Project Paperclip. German Scientists and the Cold War* (New York: Atheneum Press, 1971); and Ulrich Albrecht, Andreas Heinemann-Gruder, and Arend Wellmann, *Die Spezialisten: Deutsche Naturwissenschaftler und Techniker in der Sowjetunion nach 1945 (Specialists: German Scientists and Technicians in the Soviet Union after 1945)*, (Berlin: Dietz Verlag, 1992).

3) Lasby, Project Paperclip, p. 6.

4) During his work in the USSR in 1945-1954, Max Steenbeck also worked on electromagnetic enrichment of uranium, but his ideas and designs of centrifuges proved to be particularly groundbreaking.

5) A. K. Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR* (*How the Atomic Industry of the USSR Was Created*) (Moscow: TsNIIAtominform, 1994), p. 192.

6) Information about the US intelligence assessment only recently became available. See Gregory W. Pedlow and Donald E.

Welzenbach, *The CIA and the U-2 Program, 1954-1974* (US Central Intelligence Agency, Center for the Study of Intelligence, 1998), p. 2; and *Section 73 (Atomic Energy) NIS 26 (USSR)* (CIA document, published March 20, 1955, declassified and released May 19, 1998), available by a title search at <www.foia.ucia.gov>.

7) Samuel Goudsmit, *ALSOS* (Woodbury, New York: American Institute of Physics, 1996), p. 34.

8) V. Khapayev and E. Gudkov state that Soviet intelligence knew of the atomic developments in Germany, and also knew these developments (like manufacturing of uranium separation centrifuges) were thwarted by bomb- ings and the rapid advance of the Red Army. See V. Khapayev and E. Gudkov, "Secrets of the Caucasus Gem: German Specialists—Participants of the Build-up of the National Atomic Industry," *Atompressa* 12 (1993).

9) Full text of the letter published in Raisa V. Kuznetsova and Natalya Seleznjova, "Trevozhny Kolokol Georgija Flerov" ("The Alarm Bell of Georgy Flerov"), *History of Atomic Project* 13 (Moscow: Kurchatov Insti- tute, 1998), p. 82.

10) Ibid., pp. 85-86.

11) *Alsos* is the Greek word for "grove"; though this was probably coinciden- tal, the mission's name came to be seen as a reference to General Leslie Groves, head of the Manhattan Project.

12) Goudsmit, *ALSOS*, p. 15.

13) Vassily Yershov, "Confiscation and Plunder by the Army of Occupation," in Robert Slusser, ed., *Soviet Economic Policy in Postwar*

Germany: A Col- lection of Papers by Former Soviet Officials (New York: Research Program on the USSR, 1953), p. 1.

14) In 1945, Nikolai Dollezhal was the director at the Chemical Machine Building Institute. In early 1946, he was put in charge of designing the first plutonium production reactor.

15) Nikolai Dollezhal, U istokov rukotvornogo mira (At the Origin of a Man- made World) (Moscow: GUP NIKIET, 1999), p. 112.

16) GOKO is a Russian abbreviation for Gosudarstvenny Komitet Oborony (State Defense Committee), the chief governing body during the Great Patriotic War.

17) Translated from a photographic copy of the identification published as an illustration in Dollezhal, U istokov rukotvornogo mira , p. 229.

18) Boris Chertok, Rakety I Ljudi (Rockets and People) (Moscow: Mashinostrojenie, 1999), p. 47.

19) Until 1943, the NKVD (Peoples' Commissariat of Interior) performed the functions of both the modern Russian Ministries of the Interior and State Security, including foreign intelligence. In 1943, a separate Peoples' Commissariat of State Security (NKGB) was founded.

20) A. K. Kruglov, Shtab Atomproma (Headquarters of Atomic Industry) (Moscow: TsniiAtominform, 1998), p. 70.

21) Evidently, GULGMP had the function of providing a cheap labor force for mining and metallurgy.

22) For a historical account of Laboratory No. 2, a reader should turn to the published proceedings of the conference on the History of the Soviet Atomic Project (HISAP-96), held in Dubna in 1996 and sponsored by Kurchatov Institute. The two-volume proceedings extensively cover the

organizational and scientific evolution of the early Soviet atomic project and its brain- center—Laboratory No. 2 headed by I.V. Kurchatov. See HISAP-96 Proceedings (Moscow: IzdAt, 1999).

23) In 1946, in order to be able to knowledgably communicate with the scientists it tried to manage, the NKVD invited a prominent Soviet scientist, Alexander I. Leipunski (an academician from the Ukrainian Academy of Sciences known for his experiments on neutrino detection), to be the deputy head of the 9th Directorate and perform the functions of scientific liaison. See Kruglov, *Shtab Atompromа*, p. 72.

24) Zavenyagin was promoted to his position within the NKVD after delivering results by managing huge scale "conventional" mining operations conducted by convicts at Norilsk. See Viktor N. Mikhailov and Andranik M. Petrosjants, eds., *Sozdanije pervoi sovetskoi atomnoi bomby* (*Creation of the First Soviet Atomic Bomb*) (Moscow: Energoatomizdat, 1995), p. 404.

25) Mikhail Rudenko, "Yaderny Plagiat" ("Nuclear Plagiarism"), *Moskovsky Komsomolets*, June 10, 1996, p. 10. Probably, this was only one of several tasks assigned to this trophy recovery team. Statements near the end of this article tend to support the conjecture that the decision to create specialized search teams was made in March 1945.

26) Kruglov, *Shtab Atompromа* , p. 16.

27) Mikhailov and Petrosjants, Sozdanije pervoi sovetskoi atomnoi bomby, p. 435.

28) Rudenko, "Yaderny Plagiat," p. 10.

29) This service operated as part of the armed forces and took the motto "Death to Spies" (Smert' Shpionam) as its title.

30) Artsimovich later took charge of the Soviet effort to develop electromagnetic isotope separation technology. Khariton moved to the weapons design center Arzamas-16 where he became chief scientist.

31) Rudenko, “Yaderny Plagiat.”

32) Kruglov, Kak sozdavalas atomnaja promyshlennost v SSSR, p. 291.

33) Raisa V. Kuznetsova and Natalya V. Seleznjova, “Documents of the Per- sonal Archive of Academician I.V. Kurchatov,” HISAP-96 Proceedings 2, p. 94.

34) Golovin and Shevchenko were assisted by the 337th Border Guard Regi- ment. Traditionally, border guard troops belonged to the NKVD/KGB sys- tem.

35) Igor N. Golovin, “Problema urana v Germanii za gody voiny” (“Uranium Problem in Germany During the War”), *History of the Atomic Project* 16 (Moscow: Kurchatov Institute, 1998), pp. 46-52.

36) Out of five cyclotrons that existed in Germany in 1945, the Soviet atomic program “inherited” four. See A.A. Ogloblin, “Tsyklotrony v atomnykh projektakh” (“Cyclotrons in Atomic Projects”), *History of the Atomic Project* 12 (Moscow: Kurchatov Institute, 1997), p. 13.

37) Norman M. Naimark mentions this fact in the footnotes to his chapter “The Soviet Use of German Science,” in *The Russians in Germany* (Cam- bridge: Belknap Press, 1997), p. 523, footnote 23.

38) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 48.

39) Rudenko, “Yaderny Plagiat.”

40) Isaak Kikoin was in charge of diffusion and centrifuge methods of isotope separation.

41) Igor S. Drovenikova and Sergei V. Romanov, “K istorii poezdki sovetskikh phyzikov v Germaniju (mai-ijun’ 1945)” (“On the History of the Trip of Soviet Physicists to Germany [May-June 1945]”), in *HISAP-96 Proceed- ings* 2, p. 182.

42) Manfred von Ardenne, *Erinnerungen, fortgeschrieben: ein Forscherleben in Jahrhundert des Wandels der Wissenschaften und politische Systeme* (*Memoirs: Life of a Scientist in the Century of Changing Science and Politi- cal Systems*) (Dusseldorf: Droste Verlag, 1997).

43) Von Ardenne explained his preference for Russia by an almost unbelievable decision made as early as in 1944 to work for the Russians after the war. A reader may suspect that von Ardenne’s memoirs could have been strongly influenced by the fact that their first editions were published in the GDR, where anti-Soviet sentiments were censored.

44) Von Ardenne, *Erinnerungen*, p. 222.

45) We can only wonder if this major was the head of the chemical laboratory of the first Ukranian Front mentioned earlier.

46) V.A. Makhnjov had the title “Deputy Member of the State Defense Committee” and performed the functions of assistant and secretary to Lavrenty Beria.

47) Drovenikov and Romanov, “On the History,” p. 181.

48) Kuznetsova and Seleznjova “Documents of I.V. Kurchatov,” p. 94.

49) Following the tradition of secrecy, when dictating his memoirs Kikoin did not name the atomic problem directly, but referred to it as a “problem of interest.”

50) Drovenikov and Romanov, “On the History,” p. 182.

51) Nikolaus Riehl, head of research of Auer Company, was in charge of uranium production for the German “Uranium Club.” He recalled staying at Berlin-Friedrichschagen for a week. See Nikolaus Riehl and Frederick Seitz, *Stalin’s Captive* (Washington, DC: American Chemical Society, Chemical Heritage Foundation, 1996), p. 72.

52) Goudsmit, *ALSOS*, p. 70.

53) Laboratory No. 3 was tasked with the development of heavy water reactors, and became what is now known as the Institute of Theoretical and Experimental Physics (ITEF) in Moscow.

54) B.L. Ioffe, “Truba, pochemu ona ne proshla. Tjazhelovodnye reaktory v ITEF” (“Pipe, Why It Did Not Go Through. Heavy Water Reactors in ITEF”), in *HISAP-96 Proceedings* 2, p. 223.

55) Drovenikov and Romanov, “On the History,” p. 183.

56) Anna G. Plotkina and Evgeny M. Voinov, “Academician Isaak Konstantinovich Kikoin—Scientific Leader of the Problem of Uranium Iso- topes Separation in the USSR (1908-1984),” in *HISAP-96 Proceedings* 2, p. 198.

57) Goudsmit, *ALSOS*, pp. 125-126.

58) Von Ardenne, *Erinnerungen*, p. 226.

59) Ibid., pp. 227-228.

60) Ibid., p. 228.

61) Ibid., pp. 234-235

62) At least, von Ardenne claims this in his memoirs.

63) Heinz and Elfi Barwich, *Das rote Atom* (*The Red Atom*) (Munich and Bern: Scherz Verlag, 1967), p. 20.

64) For a detailed account of Riehl's life, see Riehl and Seitz, *Stalin's Captive*. Riehl was engaged in research into luminescence, and extraction of thorium. At the suggestion of K.G. Zimmer, Riehl talked to Otto Hahn re- garding interest of the latter in production of uranium and construction of the German "uranium machine." Hahn agreed, although he was more interested in chemistry of fission products than in the new energy source.

65) Riehl and Seitz, *Stalin's Captive,* p. 71.

66) Ibid., p. 72.

67) Ibid., p. 79

68) Drovenikov and Romanov, "On the History," p. 183.

69) David Holloway, *Stalin and the Bomb: the Soviet Union and Atomic En- ergy, 1939-1956* (New Haven: Yale University Press, 1994), p. 110.

70) Lasby, *Project Paperclip,* p. 273.

71) Ibid, p. 278

72) Scientists going to Laboratory "V" in Obninsk expected to stay there only for two years, and Thiessen's group thought they would be allowed to go back in a year.

73) Klaus Thiessen, son of Peter A. Thiessen, telephone conversation with author, July 9, 1999.

74) Natalya V. Knjaz'kaja, "I.V. Kurchatov on the Main Directions of Work in the First Stage of Solving the Atomic Problem," in *HISAP-96 Proceed- ings* 2, p. 103.

75) Andreas Heinemann-Grueder, "Soviet Atomic Project and Shortage of Uranium. Production of Uranium in Eastern Germany and Czechoslovakia after 1945," in *HISAP-96 Proceedings* 2, p. 332.

76) Charles A. Ziegler and David Jacobson, *Spying Without Spies: Origins of America's Secret Nuclear Surveillance System* (Westport, CT: Praeger Publishers, 1995), p. 10.

77) Heinemann-Grueder, "Soviet Atomic Project and Shortage of Uranium," p. 334.

78) Drovenikov and Romanov, "On the History," pp. 179-188.

79) Ibid.

80) Knjaz'kaja, "I.V. Kurchatov on the Main Directions of Work," p. 103.

81) Heinemann-Grueder, "Soviet Atomic Project and Shortage of Uranium," p. 331. Although the subject of uranium mines lies somewhat outside the activities of the Russian ALSOS groups in Germany, it should be noted that the Soviet Union benefited greatly from uranium mines in Czechoslovakia (Joachimstal) and Germany (Saxony). The Eastern European mines had much richer uranium ores than those in the Soviet Union and production of uranium in Eastern Europe far exceeded the Russian amounts.

82) Drovenikov and Romanov "On the History," p. 188.

83) Riehl and Seitz, *Stalin's Captive*, p. 82.

84) This fact is reflected in the memoirs of both von Ardenne and Riehl, the only difference is that Riehl says they were attending "Prince Igor," while von Ardenne says "Swan Lake." Von Ardenne also mentions attending a similar performance in August celebrating victory in a short Soviet-Japanese war. Von Ardenne, *Erinnerungen*, p. 233, and Riehl and Seitz, *Stalin's Captive*, p. 82.

85) Von Ardenne, *Erinnerungen*, p. 237.

86) Rudenko, “Yaderny Plagiat”

87) Riehl and Seitz, *Stalin’s Captive*, p. 83.

88) Kruglov, *Shtab Atompromа* , p. 18.

89) Von Ardenne recalls the date as mid-August in von Ardenne, *Erinnerungen*, p. 241.

90) Riehl and Seitz, *Stalin’s Captive*, p. 111.

91) Von Ardenne, *Erinnerungen*, p. 241.

92) Gernot Zippe, who joined von Ardenne’s institute in the summer of 1946 and must have heard the story of the meeting with Beria from von Ardenne, stated that Nikita Khrushchev was also present at the meeting. See Gernot Zippe, “Historical Review On the Development of Gas Centrifuges for Uranium Enrichment,” presentation at the University of Nagoya, 1998, p. 2.

93) Von Ardenne, *Erinnerungen*, p. 241, & Zippe, “Historical Review,” p. 3.

94) Klaus Thiessen, telephone conversation with author, July 9, 1999.

95) Max Steenbeck, *Impulse und Wirkungen: Schritte auf meinem Lebensweg*

(Berlin: Verlag der Nation, 1977), p. 278.

96) Barwich, *Das rote Atom*, p. 63.

97) Von Ardenne, *Erinnerungen*, p. 253.

98) Barwich, *Das rote Atom*, p. 64.

99) Kruglov, *Kak sozdavalas atomnaja promyshlennost*, p. 165

100) Barwich, *Das rote Atom*, p. 40.

101) Klaus Thiessen, telephone conversation with author, July 9, 1999.

102) *Volkssturm* literally means “people’s army.” It was a last resort measure in which untrained civilians were armed and put to defend the territory where they lived or, in case of the Siemens plant, worked. Thus, Steenbeck was the head of “organized resistance” at his plant.

103) Zippe, “Historical Review,” p. 4.

104) Artsimovich assumed leadership in the area of electromagnetic isotope separation, and must have known about an original design of a betatrone invented by Steenbeck; Zippe, “Historical Review,” p. 4.

105) “Rukovodjaschi Sostav Instituta Atomnoi Energii 1943-1965” (“Leader- ship of the Institute of Atomic Energy, 1943-1965”), in *History of Atomic Project 9-10* (Moscow: Kurchatov Institute, 1997), pp. 51-52, 57.

106) Von Ardenne, *Erinnerungen*, p. 255.

107) In 1950, when the main work at Sukhumi ended, Wilhelm Menke and von Ardenne’s sister Rinata von Ardenne moved to another MVD labora- tory for German specialists—Laboratory “B” at Sungul in the Urals.

108) Zippe, “Historical Review,” p. 7.

109) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 72.

110) Riehl and Seitz, *Stalin’s Captive*, p. 24.

111) Vladimir N. Prusakov and Alexander A. Sazykin, “On the History of Uranium Enrichment Problem in the USSR,” in *HISAP-96 Proceedings* 1, p. 159.

112) Barwich, *Das rote Atom*, p. 38.

113) See Riehl and Seitz, *Stalin’s Captive*, p. 142.

114) Kruglov, Kak sozdavalas atomnaja promyshlennost v SSSR, pp. 165-166

115) Oksana D. Simonenko, "Experimental Research for Creation of Indus- trial Methods of Uranium Isotope Separation in the USSR in 1943-1950," in *HISAP-96 Proceedings* 2, p. 442.

116) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 67.

117) Tamara Andrjuschenko, interview by author, Snezhinsk, July 14, 1999.

118) Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR*, p. 293.

119) Mikhailov and Petrosjants, *Sozdanije pervoi sovetskoi atomnoi bomby*,
p. 296.

120) The Soviet Union was involved on a large scale in the civil war in Spain in the late 1930s; taking care of Spanish children was just another form of assistance to Spanish communists.

121) A German documentary "Forschen hinter Stacheldraht" describes the history of Wolfgang Burkhardt and mentions this fact. Wolfgang Burkhardt signed a contract in Leipzig on July 29, 1946, for a laboratory assistant position with a salary of 2,500 rubles a month.

122) Rudolph H. Pose, "Vospominanija ob Obninske" ("Reminiscences of Obninsk"), in *HISAP-96 Proceedings* 2, p. 286.

123) The German team in Obninsk also included Wolfgang Burkhardt, Dr. Baroni, Dr. Ernst Busse, Dr. Hans Keppel, Dr. Willi Haupt, Dr. Karl-Heinz Riewe, Dr. Ing. Herbert Thieme, Dr. Krueger, Dr. Helene

Kuelz, Dr. Hellmut Scheffers, and Dr. Renger. See Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, pp. 61, 67.

124) Boris F. Gromov, Oleg D. Kazachkovsky, and Mikhail F. Trojanov "Sozdanije laboratorii "V" i pervy etap eje dejatel'nosti" ("Establishment of Laboratory "V" and First Phase of Its Activities"), in *HISAP-96 Proceedings* 1, p. 177.

125) Ibid.

126) This number appears to be unbelievably high and probably is a typo in the original, as the largest design conceived in Obninsk in the early 1950s was for a five MW nuclear power plant. See Gromov "Sozdanije Laboratorii "V"…" p. 180.

127) Kruglov, *Shtab Atompromа*, p. 73.

128) Ibid., p. 71.

129) Pose, "Vospominanija ob Obninske," p. 288.

130) Disruption of a defense projects in times of war can easily be considered sabotage.

131) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 67. His wife later moved to Sukhumi where she married a German draftsman Lange. In 1950, Lange and his daughter Hannelora, along with Frau Riewe and her children, arrived at Laboratory "B" in Sungul. After 1953, they all served their "stint" in the Agudzery transition camp. T. Andrjuschenko re- calls that NKVD escorts had heard that Karl Riewe had been executed for sabotage. Tamara Andrjuschenko, interview by author, Snezhinsk, July 14, 1999.

132) Riehl and Seitz, *Stalin's Captive*, p. 87.

133) Ibid., p. 92

134) Albrecht, Heinemann-Grueder, and Wellmann, *Der Spezialisten*, p. 57.

135) Eberhard Born, son of H.J. Born, correspondence with author, June 7, 1999.

136) Rudenko, "Yaderny Plagiat."

137) Kruglov, *Shtab Atomproma*, p. 40.

138) Riehl and Seitz, *Stalin's Captive*, p. 95.

139) Ibid.

140) Riehl mentions this man in his book twice and calls him the "platinum colonel." It is very likely that this was Ilja Chernjaev who, indeed, became famous for his studies of platinum and its refinement. See Kruglov, *Shtab Atomproma*, p. 37.

141) Fyodor G. Reshetnikov, "Stanovlenije i razvitije promyshlennogo proizvodstva urana i transuranovykh elementov dlja oboronnoi otrasli v Sovetskom Sojuze," ("Maturing and Evolution of Industrial Production of Uranium and Transuranium Elements for the Defense Sector in the Soviet Union"), in *HISAP-96 Proceedings* 1, p. 147.

142) Ibid., p. 147.

143) Rudenko, "Yaderni Plagiat"; Kruglov, *Kak sozdavalas atomnaya promyshlennost*, p. 297.

144) Mikhailov and Petrosjants, *Sozdanije pervoi sovetskoi atomnoi bomby*, pp. 319, 325.

145) *Section 73 (Atomic Energy) NIS 26 (USSR)* , p. 69.

146) Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR*, p. 301.

147) Riehl and Seitz, *Stalin's Captive*, p. 165.

148) Albrecht, Heinemann-Grueder, and Wellmann list his name among Obninsk scientists. See Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 61.

149) A well-known Soviet comedy “A Little Giant of Big Sex” is another example of a mass media product briefly covering a German group’s location. The plot takes place in Sukhumi and contains an episode inside a “secret institute” that must have been Institute “A” or its successor organization.

150) “Professor Timofeev-Ressovsky, former director of Kaiser Wilhelm In- stitute for Genetics and Biophyisics … was summoned to Soviet Headquarters in early September, and left for Russia the same day.” See Lasby, *Project Paperclip*, p. 141.

151) As Eberhard Born recalls, his father was arrested by the Soviet Military Administration in the fall of 1945, flown to Lubjanka—the NKVD prison in Moscow—where he was intensively interrogated on the subject of V-2 rockets and then transferred to Elektrostal. Born’s family arrived at Elektrostal on August 20, 1946. In December 1947, Born and Zimmer left for Sungul. Eberhard Born, e-mail to author, May 21, 1999.

152) Judging by Nikolaus Riehl’s interview with Mark Walker in 1985, Zimmer and Born moved to Laboratory “B” merely because it provided a more interesting job for them, not because they were badly needed there.

153) V.N. Mikhailov, ed., *Chastitsy Otdannoi Zhizni* (*Parts of a Dedicated Life*) (Moscow: Izdat, 1999), p. 432. This book is a collection of memoirs of Novaya Zemlya test site veterans.

154) Among them: Nikolaus Riehl, Rinata von Ardenne (sister of Manfred von Ardenne), Wilhelm Menke (head of radiobiology lab at Institute “A”),

W. Lange (who married widow Riewe), H.E. Ortmann, A. Baroni, Schmidt, Karl Guenther Zimmer, Aleksander Sergejevich Katsch, Hans J. Born, Joachim Pani, and K.K. Rintelen. Including dependents, there must have been nearly 50 Germans at Sungul.

155) Kuznetsova and Seleznjova “Documents of I.V. Kurchatov,” p. 97.

156) Barwich, *Das rote Atom*, p. 156.

157) Arkadi Kruglov, “Kto uchastvoval v realizatsii sovetskogo atomnogo proekta,” in *HISAP-96 Proceedings* 1, p. 62.

158) Gromov, Kazachkovsky, and Trojanov, “Sozdanije Laboratorii V…” p. 177.

159) Ibid., p. 179.

160) As Boris Chertok observed in May 1945 when inspecting aviation re- search facilities: “In answer to my question, who is the most distinguished expert in vacuum tubes, Wilki said, ‘Germany is proud of professor Manfred von Ardenne. He was a great engineer and visionary.’ ‘Why?’ ‘For the last two years he has been working on some new idea. A new secret weapon...’” Chertok, *Rakety I Ljudi*, p. 60.

161) This must have been NKVD Major A. Zhdanov who was in charge of the Sinop and Agudzery sites. Tamara Andrjuschenko, interview by author, Snezhinsk, July 14, 1999.

162) Von Ardenne, *Erinnerungen*, p. 268

163) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 68. [164] Shuetze was number 110 in the list of second class Stalin Prize winners. See Kruglov, “Kto uchastvoval,” p. 69.

165) Ibid., p. 72.

166) There was an agreement that allowed Germans in the USSR to get two eastern deutschmarks for every ruble they were paid. As von Ardenne writes, not long before their departure Eastern Germany reduced the exchange rate by 25 percent, thus putting in danger his plans of buying the land. After a special request from the Soviet Union, the GDR restored the previous ex- change rate for the scientists. See von Ardenne, *Erinnerungen*, p. 297.

167) *Section 73 (Atomic Energy) NIS 26 (USSR)* , pp. 70-71.

168) Some accounts put the number of deported scientists as high as 5,000. See Michel Bar-Zohar, *The Hunt for German Scientists* (New York: Haw- thorn Books, 1967), p. 153.

169) A.M. Rozen “Yasnye mysli ne tolko v Poljarnuyu noch” (Clear thoughts not only in the Polar night), in B.I. Ogorodnikov, ed., *I.V. Petrjanov-Sokolov* (Moscow: Izdat, 1999), p. 416.

170) Mikhailov and Petrosjants, *Sozdanije pervoi sovetskoi atomnoi bomby,*

p. 293.

171) Rozen, “Yasnye mysli,” p. 417.

172) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 70.

173) Simonenko, “Experimental Research for Creation of Industrial Methods of Uranium Isotope Separation in the USSR,” p. 439.

174) Recollections of L.R. Kvasnikov (KGB resident in New York), as quoted in Kruglov, *Shtab Atomproma*, p. 80.

175) N.M. Sinjov, *Obogaschjonny uran dlja atomnogo oruzhija i energetiki (Enriched Uranium for Atomic Weapons and Energy Production)* (Mos- cow: TsNIIAtominform, 1991), pp. 39-40.

176) Russian respect for Germany and its industry was well-founded. Even in times of war Germany was able to produce products much superior to any- thing in the Soviet Union. See, for example, B. Chertok, *Rakety I Ljudi*, where he mentions that the Germans had used nearly 80 metals and alloys in their V-2 rocket, while Soviet industry was capable of producing less than 40.

177) Rudenko, "Yaderny Plagiat," p.10; Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR*, p.167.

178) Barwich, *Das rote Atom*, p. 147.

179) Mikhailov and Petrosjants, *Sozdanije pervoi sovetskoi atomnoi bomby*,

p. 331.

180) Clove pinks oil was used as a mild pain killer by dentists. It relieves pain when it evaporates.

181) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 67.

182) Amazingly, there was strong opposition to this decision. The Gorkiy machine plant that won the contract to manufacture the first-generation machines with flat filters was against the idea, while the design bureau from the Elektrosila plant in Leningrad, which was still trying to promote its designs, wanted to adopt the new technology. In

his book, Sinjov openly speaks of "revenge by Gorkiy people." Even huge projects do not kill envy in people! See Sinjov, *Obogaschjonny uran dlja atomnogo oruzhija i energetiki*, p. 42.

183) Sverdlovsk-44 is now also known as Novouralsk. Ibid., pp. 43-44.

[184] Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR*, p. 175. [185] Ibid., p. 185.

186) Ibid.

187) Barwich, *Das rote Atom*, p. 103

188) Klaus Thiessen, telephone conversation with author, July 9, 1999.

189) Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR*, p. 186.

190) Sinjov, *Obogaschjonny uran dlja atomnogo oruzhija i energetiki*, p. 45. [191] V. Zhuchikhin, *Vtoraja atomnaja* (*The Second Atomic Bomb*) (Snezhinsk, Russia: RFNC-VNIIEF, 1995), p. 110.

192) Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, pp. 74- 75.

193) Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR*, p. 298.

194) Boron has very large neutron capture cross-section and is considered an enemy of a nuclear chain reaction.

195) Kruglov, *Kak sozdavalas atomnaja promyshlennost v SSSR*, p. 297.

196) Riehl and Seitz, *Stalin's Captive*, pp. 108-109.

197) Kruglov, "Kto uchastvoval," p. 65.

198) They were numbers 16 and 99 on the list. Ibid., pp. 66-68.

199) Riehl and Seitz, *Stalin's Captive*, p. 95.

200) Simonenko, "Experimental Research for Creation of Industrial Methods of Uranium Isotope Separation in the USSR in 1943-1950," p. 440.

201) Gernot Zippe was a graduate of the Radium Institute in Vienna and had a degree in physics. He was put on a list of POWs available for research in the Soviet Union and was picked by von Ardenne in his campaign to strengthen his institute through integration of a new workforce. For a full account of centrifuge development in the Soviet Union until 1953, see Gernot Zippe, "Historical Review of the Development of Gas Centrifuges for Uranium Enrichment," presentation at University of Nagoya, Japan, June 1998.

202) Ibid., p. 5.

203) This surmise is based on the fact that Steenbeck, Thiessen, and von Ardenne travelled to Moscow to attend the annual Scientific Council in December every year. Von Ardenne, *Erinnerungen*, p. 270.

204) Zippe, "Historical Review," p. 5.

205) Using a needle-bearing instead of a ball-bearing to support the cylinder was the breakthrough that made supercritical centrifuges possible. Because of high rotational speeds, no ball-bearing could withstand the load.

206) Simonenko, "Experimental Research for Creation of Industrial Methods of Uranium Isotope Separation in the USSR in 1943-1950," p. 441.

207) Zippe, "Historical Review," p. 6.

208) Ibid., p. 7.

209) Ibid., p. 9. According to the popular version of the Soviet atomic bomb project, progress was spurred by the letters Georgy Flerov was writing to Stalin. One may conclude that, at least on the surface,

Steenbeck's letters might have played a similar role for the centrifuge enrichment project.

210) Ibid., p. 10.

211) Sinjov, *Obogaschjonny uran dlja atomnogo oruzhija i energetiki*, p. 125.

212) Zippe, "Historical Review," p. 10.

213) The Semiconductor Institute in Kiev where Zippe and Steenbeck were kept must have been the location of another trophy German group that worked on electronics. See Albrecht, Heinemann-Grueder, and Wellmann, *Die Spezialisten*, p. 168.

214) At least, Dr. Zippe keeps a tape recording of his conversation with Yemeljanov, who agreed to his plan to get a patent. Zippe, "Historical Re- view," p. 13.

215) "Dr. Kuhlthau and his colleagues undertook to evaluate the gas centrifuge reports coming out of Europe on a continuing basis. In connection with this latter work they became interested in the Russian work described in an interview with Dr. G. Zippe who had been allowed to return to Germany from Russia. The interview had been carried out by Dr. M. Schutte who reported to Dr. K. Brewer at the Navy. … Through the most effective efforts of Dr. Kuhlthau, Dr. McDaniel and Dr. Kolstad of the AEC, and Dr. Brewer and Dr. Schutte, Dr. Zippe was invited to come to Virginia and substantially repeat the short bowl experiments which he had carried out in Russia. This work was started in August 1958 and completed in June 1960." See Jesse

W. Beams, "Early History of the Gas Centrifuge Work in the U.S.A." (Charlottesville, VA: Department of Physics and School of Engineering and Applied Science, University of Virginia. May 1975), p. 31.
216) Zippe, "Historical Review," p. 14.
217) See Sinjov, *Obogaschjonny uran dlja atomnogo oruzhija i energetiki*, p. 110.
218) Khapayev and Gudkov, "Secrets of the Caucasus Gem."
219) I.N. Golovin, "Ot laboratorii 2 do Kurchatovskogo instituta" ("From Laboratory 2 to Kurchatov Institute"), *History of Atomic Project* 1 (Moscow: Kurchatov Institute, 1995), p. 9.
220) Ye.E. Goller, "Laboratorija G.L. Shnirmana. Nachalo" ("Laboratory of G.L. Shnirman: The Beginnings") *History of Atomic Project* 11 (Moscow: Kurchatov Institute, 1997), p. 168.
221) S.L. Davydov, "Zadacha, stavshaja delom zhizni" ("The Task That Became a Whole Life"), *History of Atomic Project* 2 (Moscow: Kurchatov Institute, 1997), p. 173.
222) P.E. Nemirovski, "Na zare teorii reaktorov: idei I ljudi" ("The Dawn of Reactor Theory: Ideas and People"), *History of Atomic Project* 1 (Moscow: Kurchatov Institute, 1995), p. 86.
223) A copy of the decree on measures to support the construction of a new cyclotron at Laboratory No. 2 can be found in *History of Atomic Project* 12 (Moscow: Kurchatov Institute, 1997), p. 52.
224) Pavel E. Rubinin, "Kapitza, Beria i bomba" ("Kapitsa, Beria and the Bomb"), in *HISAP-96 Proceedings* 2, p. 273.

225) Yury N. Smirnov, "G.N. Flerov i stanovlenije sovetskogo atomnogo projekta" ("G.N.Flerov and Establishment of the Soviet Atomic Project"), in *HISAP-96 Proceedings* 2, p. 145.
226) Riehl and Seitz, *Stalin's Captive*, p. 116.
227) Slusser, ed., *Soviet Economic Policy in Postwar Germany*, p. 15.

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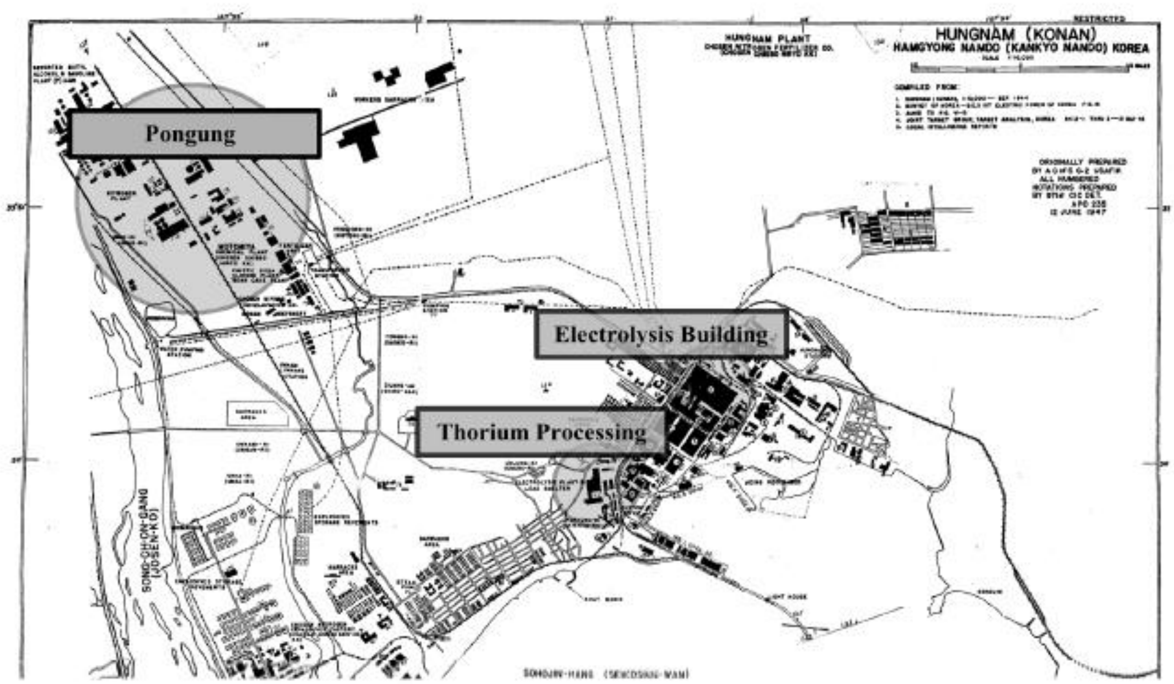
Two CIA Reports: Hungnam, North Korea by Bill Streifer



United States Air Force in Korea (USAFIK) Map of Hungnam, North Korea (1947).

{Disclaimer from the Editor: Bill Streifer's statements of fact and analysis do not necessarily reflect the official views of any government, past or present, including those of the United States and the former Soviet Union.}

Background

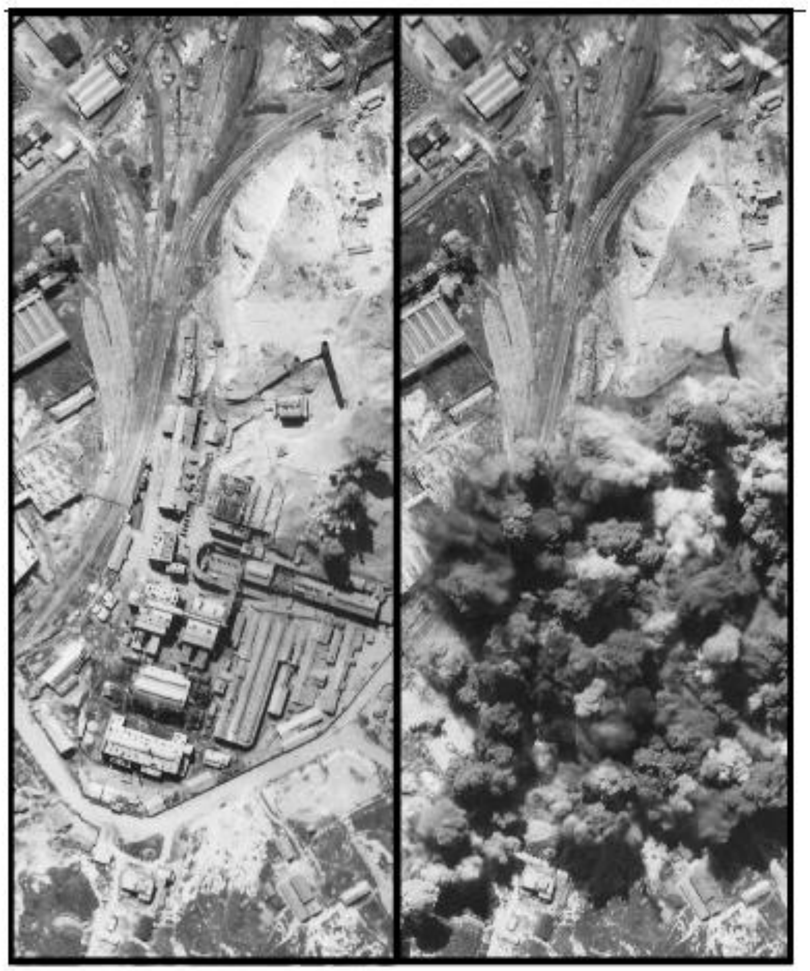
Developed in the 1930s by the Japanese industrialist Jun Noguchi, the Chosen Nitrogen Fertilizer Complex in the port city of Hungnam, North Korea (known as "Konan" by the Japanese), was the largest nitrogen fertilizer and chemical complex in the Far East. Other facilities in the area

included an explosives plant about 1.5 miles to the southwest and the Motomiya Chemical Plant about 2.5 miles to the northwest (now Pongung).[1] The Hungnam Chemical Complex, which remained undamaged throughout World War II, was demolished by B-29 bombers with the Far East Air Force (FEAF) during the early months of the Korean War. The Hungnam Nonferrous Metals plant, for instance, was attacked on August 24, 1950. The following day, in a message to General George E. Stratemeyer, the Commanding General of FEAF, General Emmett "Rosie" O'Donnell, the Commanding General of the FEAF Bomber Command, wrote the following:

> For your information, study of strike photos taken during mission on Konan [Hungnam] yesterday reveals that the one building thorium plant indicated to us by the Joint Chiefs of Staff as critical target has been thirty-five percent destroyed and has suffered an estimated additional forty percent heavy damage. Plant area immediately adjacent to this building is heavily and accurately hit. Post strike photos are still not available because weather forced reconnaissance aircraft to land at Misawa. It is thought that buildings in this area were used to process monazite sand which is a primary source of thorium and other elements in the atomic energy program. I believe this was an excellent mission conducted by one group, the nine two group [92nd BG], and results will likely have far reaching implications.[2]

described a mission in which B-29s staged heavy strikes against North Korean targets, dropping "more than 600 tons of bombs by radar on four major objectives."[3] The "heaviest blows," however, were struck on "an

outlying section of the chemical plant" at Hungnam.[4] Later, an article in *Chemical Week* remarked that "the erasure of the plants by U.S. B-29's evidently put quite a dent in the Reds' war potential," adding, "It's hard to make chemicals in a flattened plant."[5]



Thorium processing plant (Hungnam, North Korea) demolished by B-29s during the Korean War (1950). August 24, 1950

Note: The "U"-shaped building seen at the center of the Thorium processing plant is a material cart loading ramp, used for moving up raw material (ore) before it is dumped into the processing mill.

Thorium, which can be extracted from thorium oxide, which in turn can be extracted from monazite, can be converted into fissionable U-233 by means of a nuclear reactor—in much the same way as uranium can be converted into plutonium. This was of great interest to the early Soviet nuclear weapons program, which culminated on August 29, 1949, when the Russians conducted their first atomic test.[6] By 1951 about 49,000 tons of monazite, which may contain as much as 7,500 tons of thorium oxide,[7] had been excavated.[8] According to documents discovered in 1993 at the Soviet archives, North Korean leader Kim Il-sung had promised to ship far more monazite to the Soviet Union[9] in exchange for military equipment shortly before the North Korean offensive against South Korea began. Although the program to secure fissionable material from North Korean mines was interrupted during the Korean War, it resumed afterward.[10] Soviet officials investigated the exploitation of monazite deposits in North Korea "from the beginning of the occupation period in 1945," when samples of the deposits were brought to the Soviet Union.[11]

Rumors of nuclear activities at Hungnam began in October 1946 when David Snell—a reporter for *The Atlanta Constitution*, who had recently returned from military service in Seoul, Korea—reported in a front-page headline story how Japanese chemists at the Konan fertilizer and chemical complex had worked feverishly to develop the atomic bomb (including an

alleged atomic test at sea) before Soviet forces arrived in the area and how, upon their arrival, the Russians allegedly tortured Japanese scientists for their "atomic know-how." Snell's source was the Japanese head of security and counterintelligence at the plant during the war.[12]

When Snell requested permission to file the story with his "old paper" in Atlanta, the head of U.S. Army Intelligence in Seoul, LTC Cecil W. Nist, denied Snell's request, adding, "We know all about Konan, of course."[13] Snell's story in *The Atlanta Constitution* sparked harsh condemnation in Japan and the Soviet Union, as well as in the United States. Yoshio Nishina, the father of modern physics in Japan, called the story "a complete lie," the Soviet press called Snell a provocateur, and Robert Patterson, the U.S. Secretary of War, categorically denied the story without amplification. Officially, the story as reported by Snell was a "complete fabrication."[14]

TWO CIA REPORTS

Following a February 1965 visit to North Korea by Soviet Premier Alexei Kosygin, economic relations improved considerably. Then in June 1966 North Korea concluded an economic cooperation agreement with the Soviet Union which the CIA believes probably included "aid provisions for many of the unfinished projects" from an earlier agreement.[15] By 1970 a number of "Soviet-assisted projects" were completed, including the chemical plant at Hungnam,[16] which, as we have already discussed, was demolished two decades earlier. According to the CIA, Soviet trade statistics provided "the

only consistent set of information on the value of drawings under the 1966 [Soviet- North Korean] agreement.” In 1969, the year when the CIA produced a number of reports on Hungnam (including the two discussed in this article), exports to the Soviet Union totaled $126.6 million and imports $201.6 million.[17]

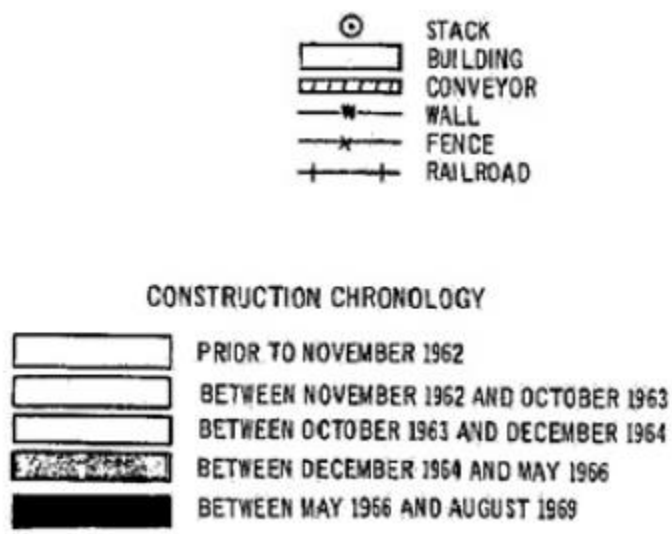
The information that follows is based on a pair of nowdeclassified “Top Secret” CIA “Basic Imagery Interpretation Reports.”[18] The first, dated June 1969, is a description of the Hungnam Chemical Plant at Pongung, and the second, dated November 1969, is a detailed description of the Hungnam Nonferrous Metals Plant, also known as the Hungnam Copper Refinery (according to the CIA/USAF’s Basic Encyclopedia). Both CIA reports have since been declassified, and yet large sections of each remain redacted. The “latest imagery used” and the targets’ Basic
Encyclopedia numbers are also redacted. The Basic Encyclopedia (BE) number (BEN) is a 10-character number containing two parts: the World Aeronautical Chart (WAC) number—four characters—and the installation number— either six numeric characters, one alpha and five numeric characters or two alpha and four numeric characters.[19] The World Aeronautical Chart provides complete world coverage with uniform presentation of data at a constant scale, and is used in the production of other charts.[20]

THE HUNGNAM CHEMICAL PLANT AT PONGUNG

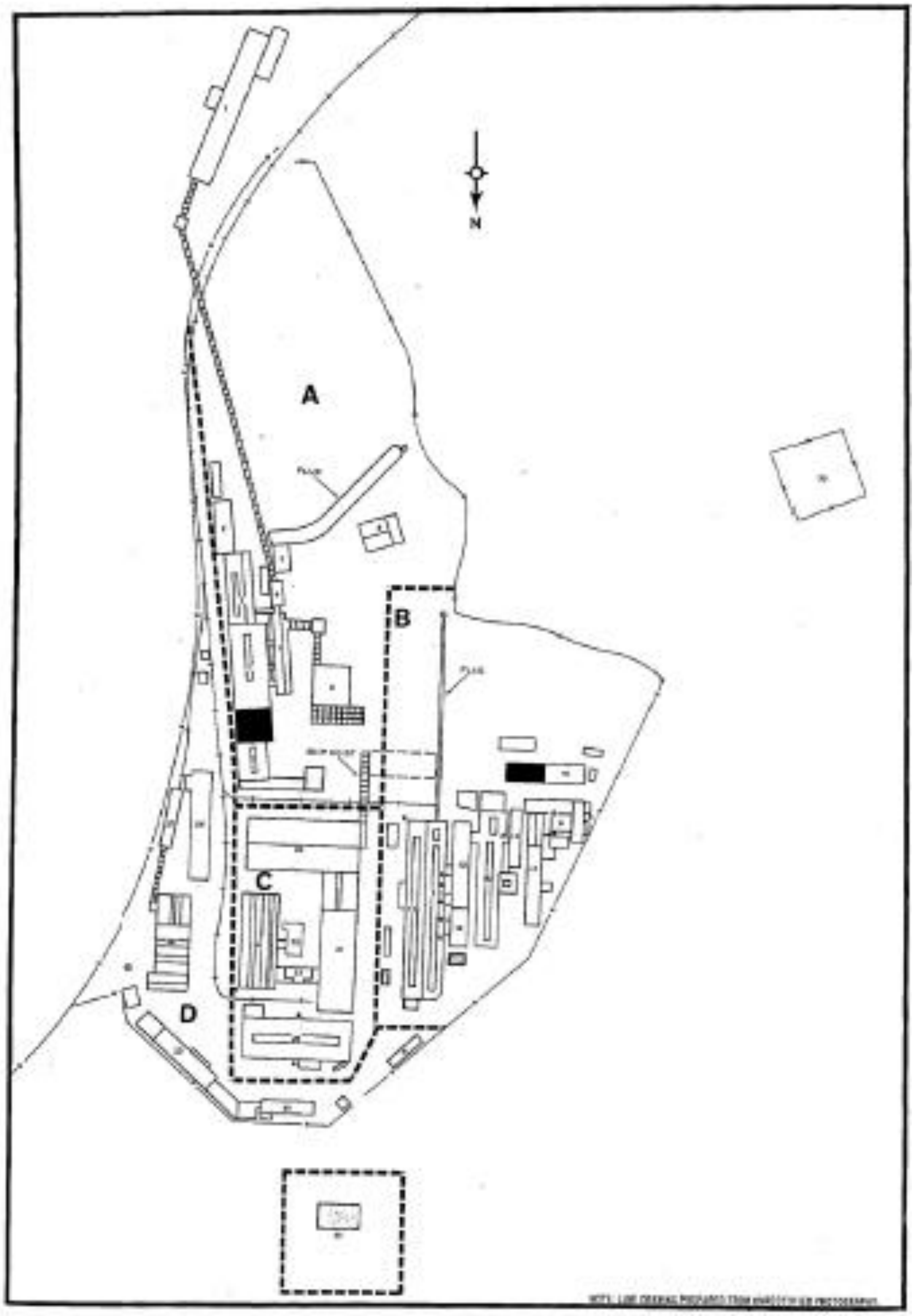
The CIA’s June 1969 “Basic Imagery Interpretation Report” on the Hungnam Chemical Plant at Pongung covered the period between late 1963 and February 1969. Based on photography, the plant was completed in October 1963, “operated continually throughout the period,” and “no significant changes have occurred since.” In addition to a photograph and a detailed line drawing of the plant, the report also includes a discussion of plant status and reference material, some of which remains heavily redacted. This report was based partially on an April 10, 1968, “Top Secret” CIA report and partially on an April 1969, “Secret” U.S. Army report.

The Hungnam Chemical Plant at Pongung, located in the northwest section of Hungnam, “is part of an industrial complex which also contains the Hungnam Nitrogen Fertilizer Plant [redacted], the Hungnam Copper Refinery [redacted], and the Hungnam Explosives Plant 17 [redacted].” As will be seen later, the “Hungnam Copper Refinery” was [more accurately] renamed the “Hungnam Nonferrous Metals Plant.” The plant at Pongung produced industrial chemicals and synthetic fibers. In addition, production facilities for caustic soda, calcium carbide, calcium cyanamide, ammonium chloride, and “probably” vinyl acetate were identified on photography. There were also facilities for the possible production of polyvinyl chloride and dyestuffs which “collateral information indicates [were] products of this plant.” Electric power was received from the regional grid through the Hungnam Transformer Station. A waterworks facility adjacent to the west side of the facility supplied it with water from the Songchon River. Well north, along the border between China and North Korea, the Songchon River flows into the Yalu River.

The Hungnam Chemical Plant at Pongung measures approximately 10,000 by 4,000 feet, and occupies 920 acres. It is secured on three sides by a wall and bordered on the fourth (on the west side) by a canal. The plant can be divided functionally into eight production areas: Probable Vinyl Acetate Production (Area A), Gas By-Product Production (Area B), Ammonium Chloride Production (Area C), Possible Dyestuff Production (Area D), Calcium Carbide and Cyanamide Production (Area F), Possible Polyvinyl Chloride Production (Area G), and Caustic Soda Production (Areas H and I). In the Caustic Soda Production areas, salt brine is electrolyzed to form caustic soda and chlorine in the electrolysis buildings. The map of the Hungnam Chemical Plant at Pongung on page 7 of the report is redacted.[21]



Chronological Legend: Hungnam Chemical Plant



<u>Hungnam Chemical Plant (Note: North is downward)</u>

	KEY TO ANNOTATIONS
AREA	DESCRIPTION
A	ORE RECEIVING AND SMELTING SECTION
	1. ORE RECEIVING STORAGE BUILDING (LOCATED OUTSIDE SECURED AREA)
	2. SUPPORT BUILDING
	3. WAREHOUSE
	4. ORE PREPARATION UNIT
	5. BAG HOUSE
	6. SUPPORT FACILITY
	7. SMELTING SECTION
	8. ORE STORAGE BUILDING
	9. ORE HANDLING FACILITY
	10. CASTING SECTION
B	ELECTROLYTIC REFINERY
	11. ELECTROLYTIC CELL SECTION (PROBABLY REFINING COPPER)
	12. ELECTROLYTIC CELL/CASTING SECTION
	13. SUPPORT SECTION
	14. RECTIFIER SECTION
	15. ACID REGENERATION FACILITY
	16. SUPPORT SECTION
	17. SUPPORT SECTION
	18. BYPRODUCTS RECOVERY FACILITIES (GOLD AND SILVER)
	19. SUPPORT BUILDING
C	ELECTROLYTIC REFINERY
	20. PROBABLE ELECTROLYTE MIXING BUILDING
	21. ELECTROLYTIC CELL BUILDING (PROBABLY REFINING NICKEL)
	22. PRECIOUS METALS RECOVERY UNIT
	23. ACID REGENERATION FACILITY
	24. ELECTROLYTIC CELL/CASTING BUILDING (PROBABLY REFINING LEAD)
	25. CASTING/STORAGE BUILDING
D	SUPPORT AREA
	26. WAREHOUSE
	27. COAL STORAGE BUILDING
	28. STEAMPLANT
	29. WORKSHOP
	30. SUPPORT BUILDING
	31. SUPPORT BUILDING
	32. ADMINISTRATION BUILDINGS (OUTSIDE SECURED AREA)
	33. TRANSFORMER YARD AND CONTROL BUILDING (OUTSIDE SECURED AREA)

<u>**Building Legend: Hungnam Chemical Plant**</u>

HUNGNAM NONFERROUS METALS PLANT

The CIA's November 1969 "Basic Imagery Interpretation Report" on the Hungnam Nonferrous Metal Plant covers the period between November 1962 and August 1969. In addition to a low-resolution photograph of the facility, the report also contains a detailed line drawing of the plant, a chronological summary of construction, and its operational status.

A detailed analysis of the plant based on high-resolution photography showed that the primary products of the plant were refined nonferrous

metals, “probably copper, lead, and nickel.” Secondary products including refined precious metals, gold and silver, which were recovered as byproducts from the electrolytic solution used in the refining process. Nonferrous ores were transported to the plant by rail from nearby mines at Munchon (120km) and Nampo (350km). In addition, small quantities of ore were brought by rail into a receiving and storage area. After smelting, these ores were further refined, again by the electrolytic process.

The CIA believed that the sulfuric acid used in the electrolytic cells was “probably provided by the sulfuric acid production facilities at an adjacent fertilizer plant.” Precious metals were then recovered as by-products from the residues within the electrolytic cells. Electric power for the plant was obtained from the regional grid through a small transformer yard west of the plant. The Hungnam Nonferrous Metals Plant occupied an irregularly shaped area approximately 1,500 by 500 feet, which contained about 18 acres. The entire plant is secured with two controlled-access entrances. A rail spur from the main rail line between Wonsan and Tanchon entered the plant from the south. A road entered the plant from the north. Berthing facilities for both ocean-going and coastal vessels were located just south of the plant on the Sea of Japan.

In 1962 the Hungnam Nonferrous Metals Plant contained two electrolytic cell buildings and a precious metals recovery unit that were “probably operational.” In addition, an ore smelting facility was present, but the first evidence of its operation was in January 1966 when smoke was seen emanating from the plant. By October 1963, a third electrolytic cell building

was observed, also “probably operational.” Between October 1963 and December 1964, a second precious metals recovery unit was constructed and coal-handling facilities for the steam plant were added. In addition, between May 1966 and November 1968 the smelter was expanded. Additional support facilities were also constructed during the “reporting period,” that is, between November 1962 and August 1969. Although the installation was previously named the “Hungnam Copper Refinery” (see “The Hungnam Chemical Plant at Pongung,” above), the plant was later more appropriately renamed the “Hungnam Nonferrous Metals Plant.” The major plant facilities were an ore smelting facility, three electrolytic cell buildings, and precious metals recovery units.

According to the CIA, the Hungnam Nonferrous Metals Plant had been “covered by overhead photography” since late 1962. At that time, the plant contained two electrolytic cell buildings, a smelter, a precious metals recovery section, and support buildings. Most of the refining facilities at the plant, however, “predate the Korean conflict.” The facilities that were heavily damaged during the war were put back into operation about 1957 with assistance from the Soviet Union. Between 1962 and 1969, an additional electrolytic cell building was constructed and the steam plant, smelting section, and numerous support facilities were expanded. Meanwhile, some minor support facilities were dismantled. According to CIA analysts, “the existing refining facilities were probably in partial operation” by November 1962 “as evidenced by the presence of rail cars, trucks, and construction activity.” The third electrolytic cell building was “probably operational in October 1963, when it was first observed

complete." On the basis of "smoke emissions from associated stacks," the smelting section was first observed in operation in 1966, and the casting section of the electrolytic cell building in March 1968. Smoke was observed emanating from these same stacks during all subsequent photography. By August 1969 the entire nonferrous metals plant appeared to be fully operational.

AIR TARGET CHARTS 548TH RTG, 200 SERIES, 4TH EDITION, APRIL 1968

Both CIA reports—"Hungnam Chemical Plant at Pongung" and "Hungnam Nonferrous Metals plant"—relied on the same map reference: 548th Reconnaissance Technical Group (RTG), April 1968, 200 Series, 4th edition.[22] As SMSgt (Ret) Bill Forsyth (former 548th Reconnaissance Technical Group) explained, the 200 Series charts were radar charts developed mainly for the Strategic Air Command (SAC). Features like cities were portrayed as they would probably have been seen on a radarscope: high-return areas would be a darker shade of magenta; small settlements/villages portrayed with circles. "We called them pop circles," Forsyth said, with an emphasis placed on vertical obstructions, such as antennas. For an April 1968 chart, the basic information would have been compiled from overhead satellite imagery—KH-4, now declassified. The first KH-4 ("Keyhole") mission, launched in 1962, brought a major breakthrough in technology with the employment of the "Mural" camera, providing stereoscopic imagery. This meant that two cameras photographed each target from different angles, allowing imagery analysts to examine KH-

4 stereoscopic photos as three-dimensional. Since the first SR-71 Blackbird mission over North Korea was flown on January 26, 1968, three days after the USS Pueblo was seized, imagery from this mission over Hungnam would not have been used to compile the base information for a chart published in April 1968. Rather, Forsyth said, it "likely did a quick update of the information on the 3rd edition chart using SR-71 imagery, and rushed it to printing." Forsyth arrived at the 548th in July 1972, after assignments in Vietnam, exploiting drone imagery, Japan, SR-71 and U-2, and an assignment at March AFB in California. After Vietnam fell in 1975, he worked mainly on North Korea at the 548th. "Loved the work," Forsyth said.[23]

Credits

1. "Hungnam Plant," Chosen Nitrogen Fertilizer Company, Hungnam (Konan), Assistant Chief of Staff G-2, USAFIK (United States Air Force in Korea), 971st CIC Detachment, June 12, 1947.
2. "Bombing of Thorium Processing Plant," Far East Air Force (FEAF), August 24, 1950 (snippet), Air Force Historical Research Agency (AFHRA). The "U"-shaped building seen at the center of #2 is a material cart loading ramp, used for moving up raw material (ore) before it is dumped into the processing mill.
3. "Basic Imagery Interpretation Report: Hungnam Nonferrous Metals Plant," CIA ("Top Secret"), Industrial Facilities (Non-Military), November 1969, p. 5.

Notes

1) 356 POWs, prisoners of the Japanese during WWII—mostly British, some Australian and a Canadian physician—were forced to work long hours under back-breaking conditions at a calcium carbide plant at the Motomiya Chemical Plant. Their experiences will be discussed in an upcoming book, *The Flight of the Hog Wild*, by Bill Streifer and Irek Sabitov (a Russian journalist).

2) ComGen FEAF Bomber Command (Yokota, Japan) to ComGen FEAF (Tokyo, Japan), August 25, 1950; "The Three Wars of Lt. Gen. George E. Stratemeyer," Air Force History and Museums Program (1999), p. 135.

3) "Official Reports Describing the Day's Fighting on Korean Fronts," *The New York Times*, August 26, 1950, p. 2.

4) *Ibid.*

5) "RED KOREA: It's hard to make chemicals in a flattened plant," *Chemical Week*, Vol. 69, 1951, McGraw Hill, p. 10.

6) For a discussion of the CIA's failure to predict when the Russians would conduct their first atomic test, see "The Shock of 'First Lightning': An Intelligence Failure?" *American Intelligence Journal*, Vol. 31, No. 1, 2013, by Bill Streifer and Irek Sabitov (a Russian journalist).

7) Californian monazite contains between 0.5% and 20% thorium; *The Tuscaloosa News*, October 21, 1946, p. 3.

8) Zaloga, Steve, *Target America*, Presidio, 1993, p. 40.

9) Weathersby, Kathryn, "Soviet Aims in Korea and the Origins of the Korean War, 1945-1950: New Evidence from Russian Archives," Working Paper No. 8 (November 1993), p. 26.

10) Zaloga, Steve. *Target America*, Presidio, 1993, p. 40.

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23) This information is based upon an online interview with Bill Forsyth in April 2014.

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Penkovskiy Papers: Chapter 9 Atomic Weapons and Missiles

The responsibility for all nuclear equipment and its safe-keeping rests with the Chief Artillery Directorate (CAD) of the Ministry of Defense. This directorate is also responsible for the production of nuclear equipment. In accordance with the decision of the Central Committee and the Supreme Military Council, CAD supplies the necessary nuclear weapons to the military districts, military groups abroad (as for example, in Germany) separate armies, and all other units which, according to the Gen-eral Staff's plans, must be armed with nuclear weapons. Of course, the CAD is also responsible for supplying nuclear weapons to all the missile troops.

The KGB is responsible for the security of all nuclear plants, scientific research institutes, laboratories, and the installations where the nuclear bombs and missiles are stored. KGB troops escort nuclear equipment while it is being transported. For this purpose the 'KGB has special vehicles, railroad cars, aircraft, etc.

The U.S.S.R. conducts scientific research work on the uses of nuclear energy for peaceful and strictly scientific purposes. But this represents a very small portion of our activities in nuclear energy. Only a few projects, such as the icebreaker Lenin and several atomic reactors, are de-voted to peaceful purposes. All the others are military.

Many of our nuclear explosions (tests) have been con-ducted in the central part of the U.S.S.R., mostly in Kazakhstan. Some of the smaller rests were

not noticed at all and were not recorded by the Western states. The large nuclear explosions are reported by TASS and the Soviet press, but nothing is ever said about the smaller ones. At the General Staff we sometimes know of tests being conducted on a certain type of nuclear weapon, and we wait to see what TASS will say about this. If TASS keeps silent, then we keep silent, too.

Testing of various new types of nuclear weapons is conducted daily. Nuclear test explosions take place more often than reported by TASS or the Soviet press. All this talk about the Soviet Union advocating the prohibition of nuclear tests is nothing but lies. Khrushchev will fire anyone who mentions complete suspension of nuclear tests. He is not ready for it. He will sign an agreement prohibiting nuclear tests only after he becomes convinced that the U.S.S.R. is ahead of the U.S. in the use of nuclear energy for military purposes. The negotiations can last another ten years without any results.

When our first atom bomb was detonated, the entire event was recorded on movie film, from the preparations to the explosion. This film is classified Secret, and it was never shown publicly. I saw it when I was studying at the Military Diplomatic Academy, where it was shown to us as intelligence officers. At the beginning the film showed the transportation of the bomb by a truck with heavy rubber tires. Officers and soldiers are guarding the vehicle. The film showed the airport and the airplane—it was hard to tell its type—and the transfer of the atom bomb from the truck to the airplane. Then there were pictures of a forest, birds singing, etc.—and a spot on the ground, indicated by a circle, where the bomb was to be dropped. Within a radius of

two kilometers or more around this spot were placed all sorts of vehicles, tanks, ordinary and reinforced concrete buildings. Animals—cows, horses, sheep, dogs, and others—were tied to trees or the structures, or simply put to graze in designated areas. This sort of arrangement was made around the target in several echelons, beginning at a distance of two kilometers from the target.

The bomb was dropped from the aircraft at a great altitude by a radio signal sent from the ground. The pilot had no control over the release of the bomb. The bomb fell not far from the prescribed target.

For a long time after the explosion various studies were conducted as to its effect on vegetation, animals, structures, vehicles, etc. These studies lasted several months. A number of prominent scientists, doctors, engineers, and various other specialists participated, using the latest scientific methods.

As a rule, neither Khrushchelv nor Malinovskiy is present at atomic tests, but there are always some representatives of the Central Committee CPSU, the government, and the Ministry of Defense in attendance. Khrushchev did attend twice, however, during practice firing of missiles. This took place at Kapustin Yar and also somewhere else in the South. Often it happens that the missiles do not leave their launching pad. (Kapustin Yar is a town about seventy-five miles to the east of Volgograd, formerly Stalingrad.) This occurred once during practice firings in the presence of Khrushchev himself. As always happens in cases like this, there was a big uproar, followed by an investigation, etc.

Foreign observers, including those from the satellite countries, are not allowed at the nuclear bomb and weapon tests. When practice firing of missiles is conducted, observers from countries of the people's democracies are sometimes allowed—with the exception of China.

There is a shortage of atomic raw materials needed for the atom bombs and missiles with nuclear warheads. This problem is being dealt with by the Chief Directorate for Atomic Energy under the Council of Ministers of the U.S.S.R. They control the consumption of raw materials. Almost all the ore containing uranium comes to the Soviet Union from Czechoslovakia. Recently some uranium ore deposits have been found in China, but they are very insignificant. Soviet monazite sands and ore deposits are not particularly rich either in elements necessary for atomic energy.

In view of this shortage of atomic raw materials, it is small wonder that our government is so interested in establishing Soviet control in the Congo. The largest uranium ore deposits are in the Congo. When Lumumba was temporarily in power the Soviets sent twenty-three planeloads of officers (including generals) there via Egypt and Sudan. The aircraft were of the IL-14 and IL-18 types; heavier types could not land on the Sudanese airfield, and other countries would not give permission for the Soviet, aircraft to land for refueling. A good friend of mine, GRU Major Aleksey Guryev, was the first one to fly to the Congo with the Soviet generals. The primary task of this mission was to establish Soviet control over the uranium ore in the Congo.

Major General Semenov, Varentsov's second deputy, spends almost all of his time in Central Asia where the nuclear tests are conducted. One of Moskalenko's deputies always goes with Semenov, too. Lieutenant General Pyrskiy, another of Varentsov's deputies, could not be present at his chief's birthday party because he was at-tending atom-bomb tests on the island of Novaya Zemlya. There is a large nuclear base on Novaya Zemlya, as well as a missile base equipped with R-12 and R-14 missiles. Malinovskiy told this to Churayev at Varentsov's party.

Other nuclear bases and storage areas are located in Norilsk, on the island of Franz Josef Land, and not far from Vorkuta. These are all in the North. In the South there are bases in Krasnovodsk, Kirovabad, and on Artem. Island. Varentsov, Kariofilli, and Buzinov sometimes travel to these bases.

On September 8, 1961, there was a regular experimental atomic explosion of a sixteen-megaton bomb. This was the first test explosion of a bomb of such force in the Soviet Union. An R-12 missile was used in this test. The missile was launched from Kapustin Yar. Varentsov was present when the missile was launched.

Later, when a fifty-megaton bomb was tested, to every-body's surprise the explosion's actual force equaled that of eighty megatons. Such great force was not expected. It was believed that some unforeseen chemical changes in the charge must have taken place after it was prepared. It is now thought that

such a bomb with a calculated force of 100 megatons may actually produce an explo-sion equaling that of 150 or 160 megatons.

More on uranium ore deposits: Uranium is mined in the area of the city of Pyatigorsk in the Caucasus. The mines are located in the mountains and are named as follows: "Byk"—where the rock contains high percentage of uranium; "Beshtau," "Verblyud," and "Zolotoy Kur-gan." Twelve kilometers from Pyatigorsk is the new town of Lermontov, where the workers engaged in the mining and processing of the uranium ore live. A uranium ore concentration plant is located on the outskirts of Lermon-tov. Uranium is mined in the area of the city of Nalchik, near the small town of Kendzha. Uranium ore deposits have also been found in the area of the city of Elista.

Why did Khrushchev unexpectedly begin to conduct new nuclear tests? (The Soviets resumed nuclear testing on September 1, 1961. They continued the practice until the nuclear test-ban treaty of 1963 with the U.S. Subsequent Soviet tests have been underground, apparently, to suit the terms of the test-ban treaty.) All nuclear tests have had and some still have two phases. The first phase deals with the explosive force in TNT equivalents. In these tests the bombs were dropped from aircraft or from special masts. The second phase tests nuclear payloads lifted by missiles.

The present tests are almost exclusively of the second-phase type. Almost all of them are conducted with missiles. First, the missiles are fired for distance and accuracy without a nuclear charge. Next, the same types of missiles are launched at the same targets, with nuclear warheads. Thus, for example, the

R-12 missile, now being mass produced, has a range of 2500 kilometers. The R-14 missile is only in the development stage and is being readied for mass production. The range of the R-14 missile with a nuclear warhead is 4500 kilometers. The range of the R-14 missile with conventional warhead is much greater.

According to Buzinov, the cost of the missiles is very high. For example, the R-11 missile with a conventional demolition warhead costs 800,000 rubles; the same missile with a nuclear warhead will cost from five to ten times as much, depending on the particular TNT equivalent of the warhead. That is where the people's money goes. That is the reason why a laborer is paid sixty to eighty rubles a month.

Why is Khrushchev pushing his nuclear tests? Why is he unwilling to sign the agreement forbidding nuclear weapons' tests? Because most of our missiles have not even passed the necessary tests, let alone reached the mass-production stage. There have been many instances of missiles and satellites exploding in the air or disappearing completely. But Khrushchev persistently does everything possible to improve missile weapons. He wants to seize initiative and to show the West that he is ahead in field of missile production, as regards quality as well as quantity. Khrushchev and our scientists are still quite from being able to prove such a superiority; but they a-.-e working hard to improve all types of missile weapons.

Khrushchev often boasts about the Soviet missiles or spreads all kinds of propaganda about them. Often a new-model missile is still only in the testing

stage—in fact, tests may have proved unsuccessful—but there he is, already screaming to the entire world about his "achievements" in new types of Soviet weapons. The idea of Khrushchev and the Presidium of the Central Committee is to demonstrate somehow Soviet supremacy in the nuclear field by any possible means: by launching new sputniks, by nuclear explosions, etc. In short, Khrushchev often brags about things we do not yet have. Varentsov, when commenting on Khrushchev's behavior, often says: "We are only thinking about those things, we are only planning. Even if we have actually achieved some successes here and there, we still have a long way to go before we actually achieve the things about which Khrushchev keeps talking and boasting." Varentsov has always stressed the fact that we do not have enough qualified personnel, that their training is inadequate, that the quality of production is poor, and the quantity is inadequate,

Sometimes this pushing of Khrushchev's for premature achievement has disastrous results. The sudden death of Marshal Nedelin, chief of our missile forces, was a case in point. Khrushchev had been demanding that his specialists create a missile engine powered by nuclear energy. The laboratory work concerning such an engine had even been completed prior to the forty-third anniversary of the October Revolution in 1960, and the people involved wanted to give Khrushchev a "present" on this anniversary—a missile powered by nuclear energy. Present during the tests on this new engine were Marshal Nedelin, many specialists on nuclear equipment, and representatives of several government committees. When the countdown was completed, the missile failed to leave the launching pad. After fifteen to twenty minutes had passed, Nedelin came out of the shelter,

followed by the others. Suddenly there was an explosion caused by the mixture of the nuclear substance and other components. Over three hundred peo-ple were killed.

A few people miraculously survived, but all of them were in deep shock. Some of them died soon afterward. What was brought to Moscow were not Nedelin's and other victims' remains, but urns filled with dirt. Yet we all had read in the "truthful" official government statements printed in the newspapers Pravda and Izvestiya only that Nedelin died, "… in the line of duty—in an air accident," and we also read about how these bodies were cremated, as well as other details about the funeral. The rest of the victims were buried quietly, without any fanfare. A period of mourning was announced in cities where some of the scientists who perished had lived or gone to school. I know that a long mourning period was announced in the city of Dnepropetrovsk.

This, incidentally, is not the first time that a missile accident took place. There had been others before this, but the government keeps silent about them. It would be appropriate at this point to tell of another terrible accident that happened to a helicopter about which Krushchev at one time bragged to President Eisenhower.

In May 1961, near Odessa, practice firing of combat missiles was being conducted with representatives from the satellite countries attending. On May 17 a group of Soviet generals including General Kolpakchi, Chief of Com-bat Training of the General Staff; General Perevertkin, Deputy

Chairman of KGB; General Goffe, Varentsov's deputy; General Morozov, Chief of the Operations Directorate of the Odessa Military District; and others were flying to the proving grounds near the city Of Nikolayev in a helicopter belonging to Lieutenant General Babadzhanyan, Commander of the Odessa Military District. While they were already over the proving grounds, one of the large rotor blades broke loose, and the helicopter crashed into the ground.- Everybody including the crew was killed. All bodies were mangled terribly, and the relatives were not even allowed to see them. Soviet newspaper accounts of this tragedy merely said that they died in an air accident. After the cremation the urns were placed on display at the Central Theater of the Soviet Army. Thefuneral was attended by hundreds of generals and officers, including Varentsov, who was very much upset by the -oath of his deputy. There were also other accidents involving this same type of helicopter. Here is a striking example of effrontery and deceit! After that, how can one trust the statements of the central party organ and the government, which always claim that say nothing but the truth? Let the entire world know that Marshal Nedelin perished in a nuclear explosion, and that there has been such an accident!

The Dzerzhinskiy Artillery Academy (now the Missile Academy) has a total of 2500 students. From 450 to 600 officers are graduated from this academy every year. But `here is only one Missile Academy, and even after their graduation from it the officers will have to have several years of special training in order to become qualified and valuable missile specialists, capable of controlling modern equipment. A missile is not a cannon on two wheels which can be turned in any direction. Khrushchev is blabbing that we are ready, we have everything. This is just so much idle talk. He himself

probably does not see the whole picture. He talks about the Soviet Union's capability to send missiles to every corner of the world, but he has not done anything about it because he knows that we are actually not ready. Of course, we can send our missiles in different directions as far as the United States, or Cuba, etc. But as far as launching a planned missile attack to destroy definite targets is concerned, we are not yet capable of doing it. We simply do not have missiles that are accurate enough.

According to the information acquired from Varentsov and others, many of our big missiles are still on the drawing boards, in the prototype stage, or are still under-going tests. There are altogether not more than a few dozen of these, instead of the "shower" of missiles with which Khrushchev has been threatening the West. (Here Penkovskiy is referring to the ICBM, not the IRBM, which was in production at that time.) The launching of the first sputnik required the combined efforts of all Soviet scientists and technical personnel with the entire technological capacity of the country at their disposal.

Several *sputniks* were launched into the stratosphere and never heard from again. They took the lives of several specially trained astronauts.

Khrushchev's boasting is also meant to impress the Soviet people and to show them that we are strong. Of course, there have been some fine achievements in the development and improvement of tactical and operational short-range missiles. It is still too early, however, to speak of strategic missiles as perfected. Accidents and all sorts of troubles are daily

occurrences. In this connection, there is much talk about shortcomings in the field of electronics.

There have been many cases during the test launchings of missiles when they have hit inhabited areas, railroad tracks, etc., instead of the designated targets, after deviating several hundred kilometers from their prescribed course.

The vigilance of the Western powers, however, must not be weakened by the shortcomings mentioned above. If at the present time the Soviet ballistic missiles are still far from being perfect, in two or three years—perhaps even sooner—Khrushchev will have achieved his goal; this is something for everyone to keep in mind.

Right now we have a certain number of missiles with nuclear warheads capable of reaching the United States or South America; but these are single missiles, not in mass production, and they are far from perfect. Every possible measure is taken to improve the missiles and their production. Money is saved everywhere and allocated to the building of "kindergartens," the slang expression we use for missile production. Scientific and technical personnel are being mobilized.

Many different towns have been built for the scientists and the technical and engineering personnel: Not only have scientists and engineers been awarded decorations and medals, but some have been awarded the title of Hero of Socialist Labor three or four times. They have received the Lenin Prize and

other prizes. The work of these people is not publicized and their pictures do not appear in the newspapers. Sometimes they may be seen at some important conferences or at Party congresses which they are invited to attend. From this it may be deduced that they are secretly given awards, Lenin Prizes, titles of Hero of Socialist Labor, etc.; this is not made public.

Thus, for example, Vladimir Nikolayevich Chelomey, a missile designer, is the foremost specialist on missiles. He has two laboratories in Moscow. Khrushchev's son works in one of them. Chelomey is a civilian engineer. He developed the "cruise" missile which has been adopted as armament on submarines. It is also used by the ground troops.

The cruise missile will have several different combat designations. A very sensitive altimeter and a special range finder have been developed for this missile, which will enable it to fly around various heights and mountains when launched to the height of 200 to 300 meters above the horizon. Soviet specialists claim that when launched to this height (200 to 300 meters) and with its high speed of flight, this missile will be extremely difficult, if not impossible, to destroy in the air along its trajectory. Tests conducted with regard to these features proved completely successful. In its flight around obstacles over 300 meters in height, the missile's maneuverings will be automatic, i.e., all changes in its flight will be controlled by instruments on board the missile.

For example: Suppose the missile is launched to the height of 250 meters above the horizon. Thirty seconds later it must fly over a mountain 1000

meters high. At twenty-five seconds after the start the missile instruments record the approaching mountain and the missile begins its gradual ascent remaining at 250 meters from the mountain slopes, i.e., when the missile flies over the highest point of the mountain, it will be 1250 meters, above the horizon. After flying over the mountain it will come down 1000 meters, etc.

When Khrushchev announced at the beginning of 1960 that the Soviet Union possessed a completely new and terrifying type of ballistic missile, he actually had in mind the order he issued to invent or prepare a new type of propellant based on nuclear energy. Some of the work in this direction has proved quite successful, but it is still far from what Khrushchev has in mind. There is a big lag in electronics. There were many accidents during tests. In this respect my sympathies are with the Americans. If they have an accident, it is all in the papers; everyone knows about it. But in our country everything is kept secret.

There were several unsuccessful launchings of sputniks with men killed prior to Gagarin's flight. Either the missile would explode on the launching pad, or it would go up and never return.

When Gagarin made his flight, it was said officially that there was not a single camera in his sputnik. This was nothing but a big lie. There was a whole system of cameras with different lenses for taking pictures and for intersection. The photographic equipment was turned on and off during the flight by the astronaut. But Khrushchev tells everybody that nothing was photographed. Photographic equipment has been installed on all sputniks,

but this has been denied in order to prevent the Americans from launching espionage sputniks or, as we call them, "spies in the sky."

Our people in the General Staff felt very uncomfortable when they learned that the Americans had launched a satellite which would fly over the territory of the U.S.S.R. They denounced this as a spy satellite. They believe that this satellite can make photographs, which frightens them. Immediately an order was issued to all major Soviet military targets to improve their camouflage.

All Soviet missiles made at the present time are of the two-stage type. In the past we had some three-stage missiles, but then it was decided that the two-stage missiles were easier to control.

General Grigoryev, commander of a brigade of strategic missiles under Marshal Moskalenko (his brigade is stationed in the Far North), told Pozovnyy that his depot, which contained nuclear warheads, was flooded by water. Therefore it was necessary to move the warheads to an-other location. Malinovskiy has two launching pads. The launching capacity of each pad is one missile a day.

Colonel Fedorov is commander of a ground-forces missile brigade in East Germany. Brigadier General Vinogradov is also the commander of a missile brigade in East Germany.

There is a large, well-equipped airfield in the area or city of Zhitomir, where long-range heavy bombers capable of carrying atom and hydrogen bombs are based.

Training flights by bombers with these bombs are made regularly from this airfield. Serving at this airfield is General Pozovnyy's nephew, a lieutenant, who recently visited Moscow and told Pozovnyy that he frequently makes flights in the westerly direction all the way to the border of the U.S.S.R., with atom bombs in his bomb bay.

Recently in Moscow I saw Colonel Igor Andreyevich Gryzlov, Deputy Chief of the Missile Artillery Supply Directorate of the Soviet Army (the Directorate's Chief, Colonel Gorelikov, has been recommended for promotion to a general), who was on a ten-day visit. Gryzlov is a close friend of mine, and when I was studying at the Dzerzhinskiy Academy, he was Deputy Chief of the 4th Faculty of the Academy.

Colonel Gryzlov told me that the 34th Artillery Division is included in the composition of the Soviet forces stationed in East Germany.

Colonel Nikiforov, Varentsov's former Chief of the Personnel Section, had arrived in Germany and assumed command of a missile brigade (same type of brigade as the one commanded by Colonel Fedorov.)

Besides the missile-firing ground at Kapustin Yar, two new firing grounds have been equipped and put in operation, one at Shklo Yar in Lvov oblast,

and one in the area of Nikolayev in Odessa oblast. The command-staff exercises of the Warsaw Pact Command personnel held last April in Moscow at the General Staff were followed in May by practical exercises with troops and with field firing of missiles. They were attended by representatives of those satellite countries which have received missile equipment.

Missiles were fired from two firing ranges. The Yauer firing range's missile impact area is in Poland, and that of the Nikolayov firing range in Rumania (the impact bases are located in some marshy areas).

So, we fire at Rumanian cornfields, or as we say, at Rumanian "mamalyzhniki." [Mamalyga is a Rumanian national dish which is made from corn.]

At the end of 1961 a firm directive was issued to equip the satellite countries with missile weapons. This was by a special decision of the Central Committee CPSU. In this regard Marshal Varentsov made the following comment: "They say we must give our brother Slays missile weapons. So we give them missiles now, and later they will stick a knife in our back." Marshal Varentsov flew to Poland, to Hungary, and to other countries of the people's democracies, including North Korea and China. This was approximately at the beginning of 1961. To this day Varentsov still receives presents from the Chinese—real Chinese tea which he loves to drink.

The first country to receive missiles from the U.S.S.R. was East Germany, in 1P60.

There have been many cases in which the construction of small factories, apartment houses, or office buildings was suspended ,in order to divert funds to the defense industry and give assistance to the satellite countries.

In my opinion as a General Staff officer, it will take a year or a year and a half for us to be able to equip all our satellite countries with missiles. In order to stop this armament of Khrushchev's and his attempts to launch an attack, the Western countries must triple both their efforts at unity and their increase in armaments. Only then will Khrushchev realize that he is dealing with a strong adversary.

I wish to repeat that I know the exact location in some areas of the launch sites for missile troops where nuclear warheads have been set up: Novaya Zemlya is the number-one center; Norilsk; farther, in the area of Franz Josef Island; in the Vorkuta area. This is all in the North. Now the South: in the areas of Krasnovodsk and Kirovabad; these are directed against Iran, Pakistan, and Turkey.

Here is an interesting note. A Japanese by the name of Sato was on a visit in the U.S.S.R. He wanted us to show him the island of Artema near the city of Baku because he was interested in the problems of drilling underwater oil wells. We sent a special inquiry to the General Staff. The answer, which was

classified Secret, stated that no foreigners were allowed on the island; a missile base and an antiaircraft defense base were located there.

The sputnik-launching base is located near Orenburg (formerly Chkalov). Gagarin was launched from there.

Missile bases directed against England are located north of Leningrad, in Karelia.

There are missile plants in the Urals and in Gorkiy. Also, there are so-called "powder candies [porokhovyye konfety] in the Ukraine. Everybody calls missiles "modem weapons," i.e., when someone does not want to discuss secrets, he refers to missiles as "modern weapons."

The warheads for atomic shells are manufactured in the city of Klintsy.

One very important airbase is located near Zhitomir. There is also a large airbase near Lvov. By order of Khrushchev, the personnel of this airbase have been trained in handling and carrying atomic bombs. The air-craft can fly across Rumania and Bulgaria.

I have heard already some talk about a woman astronaut being readied for a flight into the stratosphere in a sputnik for propaganda purposes (Valentina Vladimirovna Tereshkov a was launched into orbit on June 16, 1963). All the higher commanders think that such a flight will have a strong propaganda effect. The launching is planned for the beginning of 1963.

A huge artillery base is located in Mozhaysk (Town about sixty-five miles west of Moscow). A certain Captain Yevgeniy Mikhaylovich Sklyarov works there. He was not allowed to go abroad because he has no parents. In the Soviet Union persons who have no parents or close relatives are not allowed to go abroad be-cause it is feared that they will leave and never return.

China has not been given a single nuclear missile, nor any other kind of nuclear weapon. The Chinese have been given conventional missiles just as the other countries of the people's democracies, and it is possible that they will be given nuclear missiles if it becomes necessary. But so far they have not received any. The Chinese themselves can manufacture conventional missiles, using our blueprints.

A kind of headquarters has been built underground in the Urals to be used in case of war by the Central Committee CPSU, the Ministry of Defense, and all the other vitally important government agencies. Also in the Urals are many aviation plants and hangars, hidden deep under-ground.

A new type of aircraft with a delta wing has been designed and is undergoing extensive tests. The ceiling of this aircraft is higher than thirty kilometers.

A few more words about artillery and missiles. There are two higher educational institutes in the U.S.S.R. which train personnel for conventional

and missile artillery; this is not counting the schools and separate courses which provide training in narrow fields. The academies are: The Dzerzhinskiy Military Engineering Artillery Academy in Moscow and The Leningrad Artillery Academy in Leningrad; it is a command school rather than an engineering school.

For a long time there was a Foreign Department in the Moscow Academy in which officers of the satellite countries of Eastern Europe as well as Korea and China were trained. But after two Germans, one Pole, and one or two Hungarians were arrested for spreading anti-Soviet propaganda and having contact with foreign embassies in Moscow, this department was moved to the city of Voronezh. Each department also has its chief, deputy chief, and a full-time secretary of the Party bureau. Then there are the senior instructors, instructors, teaching assistants, and lab-oratory technicians.

Periodically, higher academic courses are organized by the academy to teach the latest missile techniques and other problems of artillery art. I finished one of these special courses in 1959. When I was there, there were eighty students attending this course—twenty of them upon finishing the' course were assigned to the ballistic missile troops.

In 1959 the Military Academy for Antiaircraft Defense was organized in the city of Kalinin, in close conjunction with the Dzerzhinskiy Academy. It is now training artillery missile personnel for antiaircraft defense.

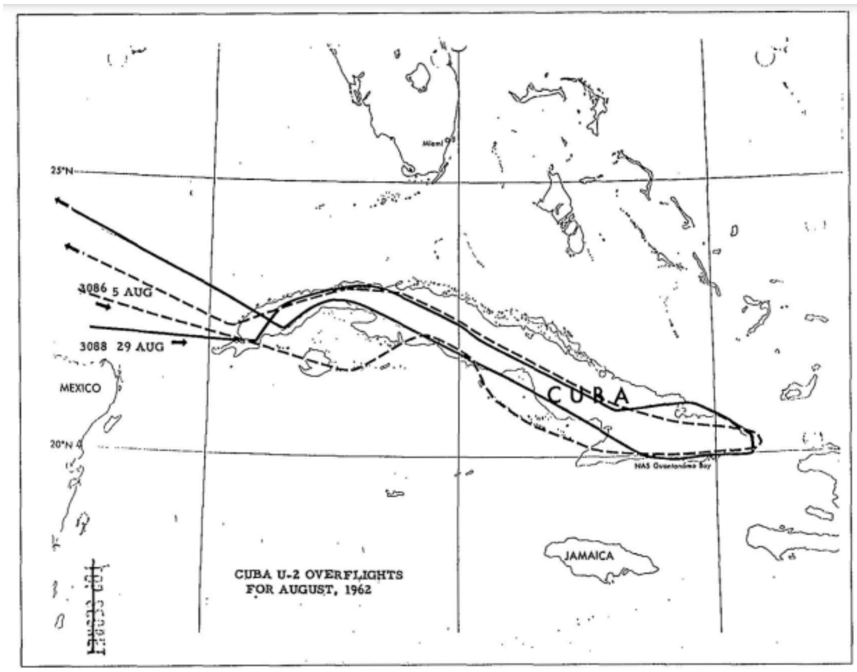
Besides this academy, on Khrushchev's orders, a special scientific research institute has been organized to work on the problems of control and communications in the field of electronics, etc. One experimental missile battalion has been attached to this institute. The entire work of this institute is directed toward the development of means of antimissile defense, or antimissile missiles. Varentsov, Pozovnyy, and Buzinov told me, "Thank goodness, Khrushchev is finally turning from loud words to deeds."

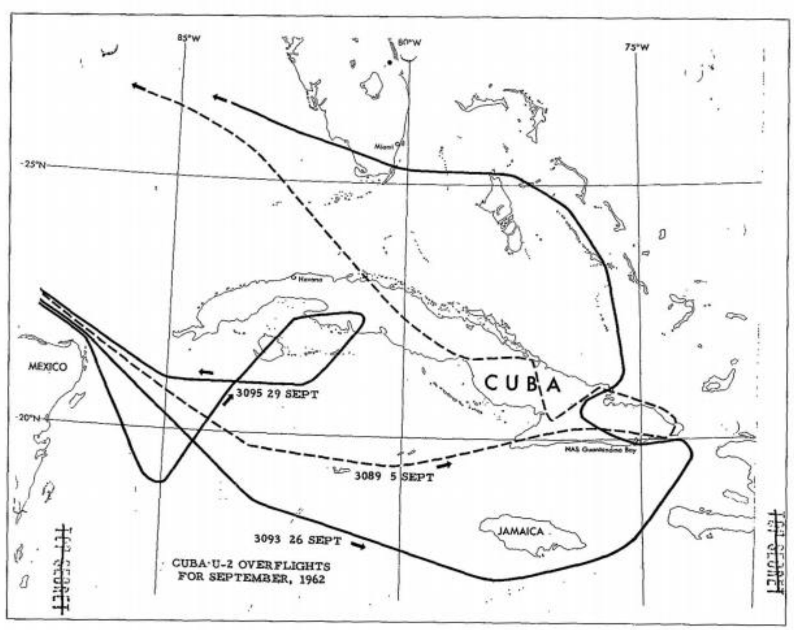
I must say frankly that on the basis of what I heard from Varentsov and others, we have no existing means to fight enemy missiles. Work is being conducted, however, in direction with a considerable rate of speed.

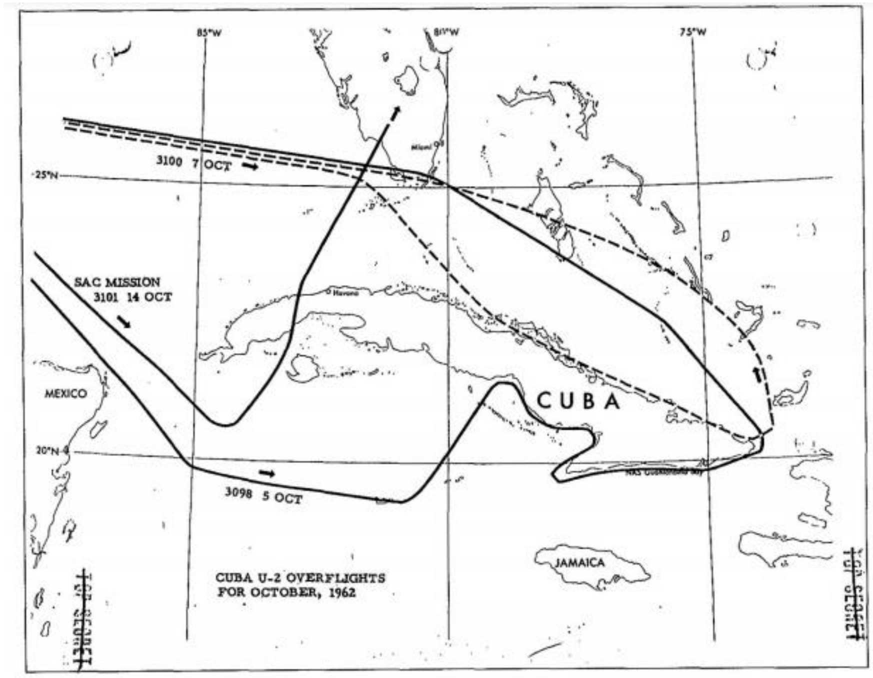
Noting such shortcomings and gaps in the missile artillery,-Varentsov and the other artillery men often express their views approximately in this manner: "Our approach to things is always one-sided. We were carried away by missiles. Of course we must be interested in missiles, but must not ignore conventional artillery, our 'old mother cannon'. We have ignored conventional artillery, which still wrists in all our regiments and divisions, and therefore, because of these missiles, we are suffering shortages in the old classical artillery. And in general, because of these missiles, we are also short of other types of armament."

Maps of U-2 Overflights of Cuba, August – October 1962

{from the *C.I.A. Archives*, declassified, 1992}



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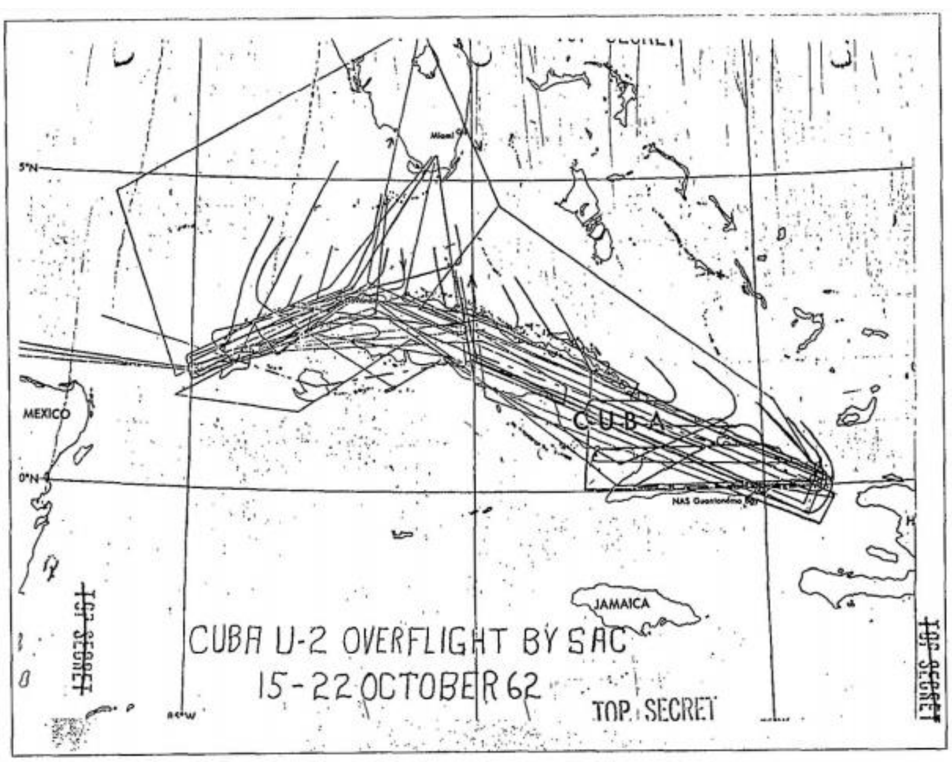
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President John F. Kennedy Speech: Cuban Missile Crisis

White House

22 October, 1962

Good evening my fellow citizens:

This Government, as promised, has maintained the closest surveillance of the Soviet Military buildup on the island of Cuba. Within the past week, unmistakable evidence has established the fact that a series of offensive missile sites is now in preparation on that imprisoned island. The purpose of these bases can be none other than to provide a nuclear strike capability against the Western Hemisphere.

Upon receiving the first preliminary hard information of this nature last Tuesday morning at 9 a.m., I directed that our surveillance be stepped up. And having now confirmed and completed our evaluation of the evidence and our decision on a course of action, this Government feels obliged to report this new crisis to you in fullest detail.

The characteristics of these new missile sites indicate two distinct types of installations. Several of them include medium range ballistic missiles capable of carrying a nuclear warhead for a distance of more than 1,000 nautical miles. Each of these missiles, in short, is capable of striking Washington, D.C., the Panama Canal, Cape Canaveral, Mexico City, or any other city in the southeastern part of the United States, in Central America, or in the Caribbean area.

Additional sites not yet completed appear to be designed for intermediate range ballistic missiles--capable of traveling more than twice as far--and thus capable of striking most of the major cities in the Western Hemisphere, ranging as far north as Hudson Bay, Canada, and as far south as Lima, Peru. In addition, jet bombers, capable of carrying nuclear weapons, are now being uncrated and assembled in Cuba, while the necessary air bases are being prepared.

This urgent transformation of Cuba into an important strategic base--by the presence of these large, long range, and clearly offensive weapons of sudden mass destruction--constitutes an explicit threat to the peace and security of all the Americas, in flagrant and deliberate defiance of the Rio Pact of 1947, the traditions of this Nation and hemisphere, the joint resolution of the 87th Congress, the Charter of the United Nations, and my own public warnings to the Soviets on September 4 and 13. This action also contradicts the repeated assurances of Soviet spokesmen, both publicly and privately delivered, that the arms buildup in Cuba would retain its original defensive character, and that the Soviet Union had no need or desire to station strategic missiles on the territory of any other nation.

The size of this undertaking makes clear that it has been planned for some months. Yet only last month, after I had made clear the distinction between any introduction of ground-to-ground missiles and the existence of defensive antiaircraft missiles, the Soviet Government publicly stated on September 11, and I quote, "the armaments and military equipment sent to Cuba are

designed exclusively for defensive purposes," that, and I quote the Soviet Government, "there is no need for the Soviet Government to shift its weapons . . . for a retaliatory blow to any other country, for instance Cuba," and that, and I quote their government, "the Soviet Union has so powerful rockets to carry these nuclear warheads that there is no need to search for sites for them beyond the boundaries of the Soviet Union." That statement was false.

Only last Thursday, as evidence of this rapid offensive buildup was already in my hand, Soviet Foreign Minister Gromyko told me in my office that he was instructed to make it clear once again, as he said his government had already done, that Soviet assistance to Cuba, and I quote, "pursued solely the purpose of contributing to the the defense capabilities of Cuba," that, and I quote him, "training by Soviet specialists of Cuban nationals in handling defensive armaments was by no means offensive, and if it were otherwise," Mr. Gromyko went on, "the Soviet Government would never become involved in rendering such assistance." That statement also was false.

Neither the United States of America nor the world community of nations can tolerate deliberate deception and offensive threats on the part of any nation, large or small. We no longer live in a world where only the actual firing of weapons represents a sufficient challenge to a nation's security to constitute maximum peril. Nuclear weapons are so destructive and ballistic missiles are so swift, that any substantially increased possibility of their use or any sudden change in their deployment may well be regarded as a definite threat to peace.

For many years both the Soviet Union and the United States, recognizing this fact, have deployed strategic nuclear weapons with great care, never upsetting the precarious status quo which insured that these weapons would not be used in the absence of some vital challenge. Our own strategic missiles have never been transferred to the territory of any other nation under a cloak of secrecy and deception; and our history--unlike that of the Soviets since the end of World War II--demonstrates that we have no desire to dominate or conquer any other nation or impose our system upon its people. Nevertheless, American citizens have become adjusted to living daily on the Bull's-eye of Soviet missiles located inside the U.S.S.R. or in submarines.

In that sense, missiles in Cuba add to an already clear and present danger--although it should be noted the nations of Latin America have never previously been subjected to a potential nuclear threat.

But this secret, swift, and extraordinary buildup of Communist missiles--in an area well known to have a special and historical relationship to the United States and the nations of the Western Hemisphere, in violation of Soviet assurances, and in defiance of American and hemispheric policy--this sudden, clandestine decision to station strategic weapons for the first time outside of Soviet soil--is a deliberately provocative and unjustified change in the status quo which cannot be accepted by this country, if our courage and our commitments are ever to be trusted again by either friend or foe.

The 1930's taught us a clear lesson: aggressive conduct, if allowed to go unchecked and unchallenged ultimately leads to war. This nation is opposed to war. We are also true to our word. Our unswerving objective, therefore, must be to prevent the use of these missiles against this or any other country, and to secure their withdrawal or elimination from the Western Hemisphere.

Our policy has been one of patience and restraint, as befits a peaceful and powerful nation, which leads a worldwide alliance. We have been determined not to be diverted from our central concerns by mere irritants and fanatics. But now further action is required--and it is under way; and these actions may only be the beginning. We will not prematurely or unnecessarily risk the costs of worldwide nuclear war in which even the fruits of victory would be ashes in our mouth--but neither will we shrink from that risk at any time it must be faced.

Acting, therefore, in the defense of our own security and of the entire Western Hemisphere, and under the authority entrusted to me by the Constitution as endorsed by the resolution of the Congress, I have directed that the following initial steps be taken immediately:

First: To halt this offensive buildup, a strict quarantine on all offensive military equipment under shipment to Cuba is being initiated. All ships of any kind bound for Cuba from whatever nation or port will, if found to contain cargoes of offensive weapons, be turned back. This quarantine will be extended, if needed, to other types of cargo and carriers. We are not at

this time, however, denying the necessities of life as the Soviets attempted to do in their Berlin blockade of 1948.

Second: I have directed the continued and increased close surveillance of Cuba and its military buildup. The foreign ministers of the OAS, in their communique of October 6, rejected secrecy in such matters in this hemisphere. Should these offensive military preparations continue, thus increasing the threat to the hemisphere, further action will be justified. I have directed the Armed Forces to prepare for any eventualities; and I trust that in the interest of both the Cuban people and the Soviet technicians at the sites, the hazards to all concerned in continuing this threat will be recognized.

Third: It shall be the policy of this Nation to regard any nuclear missile launched from Cuba against any nation in the Western Hemisphere as an attack by the Soviet Union on the United States, requiring a full retaliatory response upon the Soviet Union.

Fourth: As a necessary military precaution, I have reinforced our base at Guantanamo, evacuated today the dependents of our personnel there, and ordered additional military units to be on a standby alert basis.

Fifth: We are calling tonight for an immediate meeting of the Organ of Consultation under the Organization of American States, to consider this threat to hemispheric security and to invoke articles 6 and 8 of the Rio Treaty in support of all necessary action. The United Nations Charter allows

for regional security arrangements--and the nations of this hemisphere decided long ago against the military presence of outside powers. Our other allies around the world have also been alerted.

Sixth: Under the Charter of the United Nations, we are asking tonight that an emergency meeting of the Security Council be convoked without delay to take action against this latest Soviet threat to world peace. Our resolution will call for the prompt dismantling and withdrawal of all offensive weapons in Cuba, under the supervision of U.N. observers, before the quarantine can be lifted.

Seventh and finally: I call upon Chairman Khrushchev to halt and eliminate this clandestine, reckless and provocative threat to world peace and to stable relations between our two nations. I call upon him further to abandon this course of world domination, and to join in an historic effort to end the perilous arms race and to transform the history of man. He has an opportunity now to move the world back from the abyss of destruction--by returning to his government's own words that it had no need to station missiles outside its own territory, and withdrawing these weapons from Cuba--by refraining from any action which will widen or deepen the present crisis--and then by participating in a search for peaceful and permanent solutions.

This Nation is prepared to present its case against the Soviet threat to peace, and our own proposals for a peaceful world, at any time and in any forum--in the OAS, in the United Nations, or in any other meeting that could be

useful--without limiting our freedom of action. We have in the past made strenuous efforts to limit the spread of nuclear weapons. We have proposed the elimination of all arms and military bases in a fair and effective disarmament treaty. We are prepared to discuss new proposals for the removal of tensions on both sides--including the possibility of a genuinely independent Cuba, free to determine its own destiny. We have no wish to war with the Soviet Union--for we are a peaceful people who desire to live in peace with all other peoples.

But it is difficult to settle or even discuss these problems in an atmosphere of intimidation. That is why this latest Soviet threat--or any other threat which is made either independently or in response to our actions this week--must and will be met with determination. Any hostile move anywhere in the world against the safety and freedom of peoples to whom we are committed--including in particular the brave people of West Berlin--will be met by whatever action is needed.

Finally, I want to say a few words to the captive people of Cuba, to whom this speech is being directly carried by special radio facilities. I speak to you as a friend, as one who knows of your deep attachment to your fatherland, as one who shares your aspirations for liberty and justice for all. And I have watched and the American people have watched with deep sorrow how your nationalist revolution was betrayed-- and how your fatherland fell under foreign domination. Now your leaders are no longer Cuban leaders inspired by Cuban ideals. They are puppets and agents of an international conspiracy which has turned Cuba against your friends and neighbors in the Americas--

and turned it into the first Latin American country to become a target for nuclear war--the first Latin American country to have these weapons on its soil.

These new weapons are not in your interest. They contribute nothing to your peace and well-being. They can only undermine it. But this country has no wish to cause you to suffer or to impose any system upon you. We know that your lives and land are being used as pawns by those who deny your freedom.

Many times in the past, the Cuban people have risen to throw out tyrants who destroyed their liberty. And I have no doubt that most Cubans today look forward to the time when they will be truly free--free from foreign domination, free to choose their own leaders, free to select their own system, free to own their own land, free to speak and write and worship without fear or degradation. And then shall Cuba be welcomed back to the society of free nations and to the associations of this hemisphere.

My fellow citizens: let no one doubt that this is a difficult and dangerous effort on which we have set out. No one can see precisely what course it will take or what costs or casualties will be incurred. Many months of sacrifice and self-discipline lie ahead--months in which our patience and our will will be tested--months in which many threats and denunciations will keep us aware of our dangers. But the greatest danger of all would be to do nothing.

The path we have chosen for the present is full of hazards, as all paths are--but it is the one most consistent with our character and courage as a nation and our commitments around the world. The cost of freedom is always high--and Americans have always paid it. And one path we shall never choose, and that is the path of surrender or submission.

Our goal is not the victory of might, but the vindication of right- -not peace at the expense of freedom, but both peace and freedom, here in this hemisphere, and, we hope, around the world. God willing, that goal will be achieved.

Thank you and good night.

Station Point Grey and Very Special Intelligence: Part 1

by Patrick Bruskiewich

Meeting Col. Gordon Shrum OC OBE MM

In the early 1980's I was a young student studying physics at the University of British Columbia, in Vancouver Canada. I was also the youngest serving Canadian Naval Reserve Officer in Canada. On occasion I would attend classes at UBC on Wednesdays in my naval uniform, to coincide with functions I needed to perform later in the day at HMCS Discovery.

Those particular days always proved interesting given the ambivalence at UBC towards Canadians who serve the Crown and Parliament. A sort of generational gap was evident, with the older and professorial types showing interest and respect and the younger students quick to disinterest and disrespect. By my twentieth birthday I had more hours logged on the bridge of a naval ship, than behind the wheel of an automobile, and experience that could not be equaled by any challenge then presented me at UBC.

It was during one of my "*uniformed days*" at UBC that I had the honour and pleasure to meet Dr. Gordon Shrum, OC OBE MM (Jan. 14 1896 – June 20th, 1985) a retired UBC physics professor and distinguished Canadian. I had heard of Dr. Shrum but had never met him before until just before lunch one Wednesday we happened upon each other on the third floor of the Department of Physics and Astronomy. He approached me and introduced

himself. He surprised me when he said of me “*Just the man I am looking for*.” (refer to Fig. 1: Dr. Gordon Shrum, circa 1980)

Fig. 2: Dr. Gordon Shrum, circa 1980 (Courtesy of the UBC Archives)

I gave him my best naval salute for I knew him to be a retired Colonel who had done great service to Crown and Country during the Second World War. He had started the war as a Canadian Army Lieutenant with the COTC program at UBC, ending with the rank of Colonel and an OBE (refer to Fig. 2 Lt. G. M. Shrum, 1940).

<u>Fig. 2 Lt. G. M. Shrum, circa 1940 (Courtesy of the UBC Archives)</u>

In turn he quite loudly stated "*it's good to see someone in a naval uniform in the Physics Building at UBC. You don't see that any more*." Out of the blue Dr. Shrum then asked me to join him for lunch that very afternoon.

While I knew I would miss my afternoon class if I accepted his invitation, I also knew that the professors in the Department would not mind the reason for my absence.

Dr. George Griffiths and the Battle of the Atlantic

We walked over to the Faculty club and as we made our way across campus Dr. Shrum mentioned that he had talked with Dr. George Griffiths a few days before, who had told him about our the interesting conversations Dr. Griffiths and I had over our weekly beef dip sandwiches at the old "*Bus Stop Cafeteria*" on campus. Dr. Griffiths had suggested that Dr. Shrum invite me for lunch to chat.

Dr. Griffith, an accomplished nuclear physicist, was teaching me an electronics course and when he found out that I was a naval reserve officer we struck up a friendship, which included lively discussion about things like the Battle of the Atlantic, the great submarine battle during the Second World War. (refer to Fig. 3: Dr. George Griffiths, circa 1982).

Dr. Griffiths had done wartime service with the Royal Navy's "Y-Service" in Newfoundland and had been directly involved with the allied efforts to plot, intercept and decipher naval messages to and from German U-Boats in the North Atlantic.

Our weekly conversation and lunch of beef dip sandwiches had benefited greatly by the 1976 declassification of the ULTRA Secret, as well as a 1978 book describing how the Enigma machine code was broken at Bletchley Park. Dr. Griffiths had suggested I read the 1931 book by the American Herbert Yardley titled "*The American Black Chamber*" a few days before I met Dr. Shrum for our one and only meeting.

Fig. 3: Dr. George Griffiths, circa 1982 (Courtesy of the UBC Archives)

Solving puzzles has always been a fancy to me. This was one of the reasons I chose a career in mathematics and physics and a reason why codes and ciphers intrigued me.

Governed by the Official Secrets Act

Just as we arrived at the door of the Faculty Club Dr. Shrum turned to me and asked whether I had signed the Official Secrets Act. I responded that I had. I held the door for him, and as we entered the lobby of the Faculty Club I had an odd sensation in my stomach, one of intrigue and anticipation.

Over lunch Dr. Shrum asked me some questions about the conversations that Dr. Griffiths and I had on the work the allied cryptanalysts did to defeat the Germans Navy during the Battle of the Atlantic.

It was when I mentioned that “Special Intelligence” had also played a part in the US navy’s efforts in the Pacific, particularly at the Battle of Midway, and with the shooting down of Admiral Yamamoto that Dr. Shrum slowly steered our conversation away from the Atlantic to the Pacific.

He then said to me “*what I am about to tell you is governed by the Official Secrets Act. You must promise to keep this under wraps until the matter is declassified. It is a matter of time before it will be declassified like Ultra which is now public, but I am getting old and I may not live long enough to see that day arrive.*”

I extended him my hand and I said that “*as an Officer and a Gentleman I will keep what ever we were about to discuss under wraps until it is appropriate to make public what you are about to tell me.*”

Dr. Shrum passed away in 1985, about five years after our one and only meeting. I kept my promise as an officer and a gentleman to Dr. Shrum until three decades after our luncheon and some years after the partial declassification by the NSA of the Oshima decrypts, as well as 1993 when a book by John Bryden titled “Best Kept Secret” disclosed the Special Intelligence work the radio intercept station Station Point Grey did on the

campus of the University of British Columbia did during the Second world war. [1]

It was only in 2011 that I finally stepped forward to outline the matter of Station Point Grey to the President of the University of British Columbia. As an officer and a gentleman I stepped forward to address the matter of Station Point Grey and why the decision was made to secure Station Point Grey. To secure Station Point Grey, the decision was made to require all students of Japanese Heritage to leave UBC after the attack by the Imperial Japanese Navy on Pearl Harbor on December, 7th, 1941.

The interception and deciphering of two dozen different Japanese Military, Diplomatic and technological codes by Americans, British and Canadian cryptographers was one of the greatest secrets of World War Two.

Fort Point Grey

At this point, we moved from our table to the lounge, which was empty and private. Dr. Shrum had with him a leather attaché case, which he opened, producing a series of black and white photographs which he laid out on the table, and a 1965 National Geographic titled "*Top of the World*", and handed me a copy of the 1943 Radio Engineers` Handbook by Frederick Termons. I still have the map and the Handbook.

Over our coffee and desert Dr. Shrum began to slowly and carefully describe to me a most fascinating story about Fort Point Grey and Station Point Grey.

Station Point Grey was a secret section of Fort Point Grey, which itself was part of the wartime Defence of the Port of Vancouver. The Fort was the southern point of the defence line across the entrance of the Port of Vancouver.

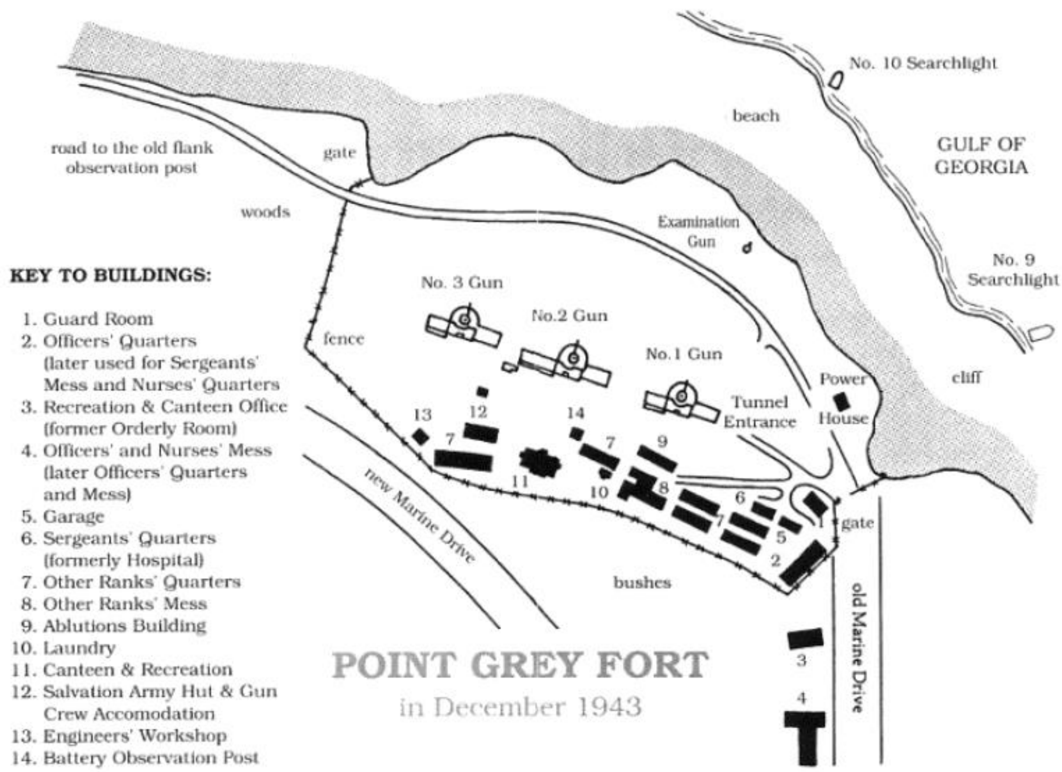

Fig. 4: Fort Point Grey, UBC, Circa 1943

Fort Point Grey was located adjacent to where the UBC Museum of Anthropology now resides. In fact the museum's centrepiece Bill Reid exhibit sits atop what was once the foundation of one of the Fort Point Grey gun emplacements (refer to Fig. 4: Fort Point Grey, UBC 1943). [2]

All the wartime buildings have long since been demolished, however, much of the concrete gun emplacements are still visible at the site and down the embankment to English Bay.

Best Kept Secret: Station Point Grey

Dr. Shrum began the story of Station Point Grey by telling me that the Point Grey Monitoring Station had been in operation since 1908. Located overlooking the Straits of Juan de Fuca, the site had been used to monitor radio traffic across BC and maritime radio traffic off the West Coast of Canada.

Fig. 5: Point Grey Monitoring Station Looking South,

circa 1940 the UBC campus is in the background.

(Picture from the Hayes Private Collection, Victoria)

In 1937 the Point Grey Monitoring Station was transferred over to the newly created Department of Transport. In 1939 Point Grey Monitoring Station began radio intercept work for the war effort (refer to Fig. 5: Point Grey Monitoring Station Looking South, circa 1940).

From 1940 onwards the Station Point Grey intercept operators were using state of the art heterodyne receivers, and manual transcription of the intercepts. Intercept stations at the naval base at Esquimalt near Victoria, BC, on Lulu Island and at Masset north of the Queen Charlotte Islands would also cover the region for the *Examination Unit* in Ottawa, the home of Canada`s wartime cryptanalysts, as well as Naval and Army intercept clearing centres.

Fig. 6: Facing North Along the Antenna Array at Station Point Grey, circa 1943, Station Point Grey is to the left, while the station chief's house is to the right, (Source: Private Collection of W.J. Bowerman).

During the Second World War the two storey building housed upwards of two dozen radio intercept operators. Part of the function of the soldiers at Fort Point Grey was to protect and secure Station Point Grey. After the Imperial Japanese Navy attacked the US Fleet in Pearl Harbor in December 1941 the security of Station Point Grey with regards to the war in the Pacific became of primary importance.

A number of different radio networks were monitored by the radio intercept operators at Station Point Grey, however no network was more important to the work done at this `Y Station` than the diplomatic traffic to and from the war time Imperial Japanese Government in Tokyo.

Station Point Grey and the Japanese Diplomatic Code

Dr. Shrum unfolded the 1965 National Geographic titled "*Top of the World*", took out a pencil from his jacket and marked a big X on Berlin, Tokyo and Vancouver (I still have it tucked away in the Termon handbook).

He then said "*You're a naval officer, tell me what you see when I ask you to group Berlin, Tokyo and Vancouver together*."

Studying the map, my answer was immediate, "*they are equidistant from each other, and nearly at the same latitude*."

He continued, "*Good. You probably know a thing or two about radio, what do you think being equidistant means*?"

My answer was definitive "*if you can hear Berlin in Tokyo or vice versa, you can hear either in Vancouver. Something about atmospheric bounce*."

Dr. Shrum responded "*you have just figured out one of the great secrets of the Second World War. During the war if you had made this secret public they would have put you against a wall and shot you, or at the very least locked you away for a very long time.*"

At this point we were interrupted by a waitress who was bringing us more coffee. When she left he continued, "*from 1942 onwards both the Americans at Arlington Hall in Maryland, and the British at Bletchley Park in the UK, asked Station Point Grey to do some special intelligence work for them*."

"*The most important messages they were intercepting", he said, "were those between the Japanese Ambassador in Berlin, General Hiroshi Oshima to the Japanese Foreign Ministry in Tokyo. These messages were decrypted and help the allies in their war effort*." (refer to Fig. 7: General Hiroshi Oshima, Japanese Ambassador in Berlin).

With the special intercepts he said the operators would use wax cylinder recorders to intercept and record the Katakana code emissions of the Japanese Diplomatic to and from Tokyo. A high-speed teletype system also connected Station Point Grey with the Examination Unit in Ottawa. From

there, raw intercepts were sent on their way to Arlington Hall in the US and to Bletchley Park in the UK.

Fig. 7: General Hiroshi Oshima, Japanese Ambassador in Berlin

Dr. Shrum continued, "*what made this source so special was the Ambassador's special relationship with Adolph Hitler. He was a close and personal friend of the Nazis leaders*." (refer to Fig. 8: Ambassador Oshima presenting his Diplomatic Credentials to German wartime Chancellor Adolph Hitler).

<u>Fig. 8: Japanese Ambassador Oshima presenting his Diplomatic</u>
Credentials to German Chancellor Adolph Hitler

"*Ambassador Oshima*," Dr. Shrum then explained, "*sent detailed reports of his*
discussions and tours throughout Germany and occupied Europe back to Tokyo in codes that were broken and being read by the allies. This included important messages sent on the lead up to D-Day. " (for an example of such a message refer to Appendix A: A decrypted message of Oshima's May 27th, 1944 meeting with Adolph Hitler).

He continued, "*but telling you about Oshima and Station Point Grey was not the only reason why I wanted to have lunch with you. George Griffiths tells me you understand technology*."

I mentioned that I was taking an electronics course with Dr.Griffiths and that we had lunch once a week at the "bus Stop Cafeteria.

"*He tells me that you also understand aviation and nuclear technology*." I nodded and told Dr. Shrum that my father is a retired RCAF wing commander.

"*Here's the real reason why I asked you for lunch. The Germans and Japanese had an arrangement whereby they shared advanced technology, things like aircraft and nuclear technology. The Japanese called the program Yanagi – which is Japanese for Willow. The Germans and Japanese sent submarines back and forth carrying plans and examples of the equipment*."

"*Station Point Grey also intercepted the messages for the technology exchange going on between Germany and Japan. They were sending blueprints and equipment for their Me- 163 rocket planes, the Me-262 jet planes, the V-1 buzz bombs, advanced radar and even some nuclear technology. We passed this special intelligence directly onto the Royal Navy and the United States Navy*. "

He then explained that both the RN and USN went out of their way to search for and sink these special shipments. He mentioned that the RN even had one of their submarines sink a German U-boat carrying special cargo to Japan while outbound from Norway during world war two. (refer to Fig. 9: Admiral Raeder and German U-Boat Admiral Donitz meeting with the officers of a Japanese Submarine Yanagi Crew).

"*When George told me he was teaching a naval officer I wanted to meet you for lunch and tell you myself that because of the work of Station Point Grey the allies managed to sink all but a handful of the Yanagi submarines. This changed to course of the Second World War*." I mentioned to Dr. Shrum that I had read about the success the allies had in sinking German U-boats but not about the Yanagi program.

He continued, "*but there is something even more interesting. George has also mentioned to you that the Axis had a bomb program*." I nodded that Dr. Griffiths and I had spoken briefly about the German Atomic bomb.

Then Dr. Shrum dropped a bombshell. "*The Germans had an advanced design for an atomic bomb which they successfully tested and which they shared with the Japanese. If you talk with Fred Kaempffer he can tell you more about this*."

<u>Fig. 9: Admiral Raeder and German U-Boat Admiral Donitz</u>

meeting with the officers of a Japanese Submarine Yanagi Crew

Dr, Gordon Shrum looked at his watch then got up out of his chair. Our lunch and chat at the Faculty Club came to an end. "*There is someone I would like you to meet and get to know*."

We talked as we walked back to the Physics building whereby Dr. Shrum deposited me at the door of Dr. Frederick Kaempffer's 3rd floor office. "*Dr. Kaempffer is expecting you*." I saluted Dr. Shrum a final time and thanked him for the lunch and for the briefing about Station Point Grey. We had arrived back exactly at 3:00. I was beckoned to enter Dr. Kaempffer's office

and would spend an hour chatting that afternoon, the first of many talking about physics and technology with a very unique physicist.

Dr. Fred Kaempffer spent the Second World War doing theoretical and applied physics at Gottingen University, in Germany. Gottingen had been a centre for advanced aeronautics and nuclear research from 1937 to 1945. After the Second World War Colonel Gordon Shrum would make arrangements to bring Dr. Kaempffer to UBC in 1949.[4]

The Most Famous Oshima Decrypted Message

Since my meeting with Dr. Shrum some three decades before, many of the Oshima messages had been declassified by the NSA (the people across the Atlantic tend to safeguard their secrets). The message in Appendix A is considered "*The Most Famous of the Oshima Decrypted Message*".

The message recounts a meeting Ambassador Oshima's had with Adolph Hitler on May 27th 1944. This meeting between Hitler and Ambassador Oshima occurred mere days before D-day, the allied invasion on June 6th, 1944, and touches on a possible landing in Normandy as a diversion to a landing at the Pas de Calais.

The 1942 Little – Denniston Agreement

An excerpt from the Bryden book about a special arrangement made by the famous cryptanalyst Commander Denniston in charge of diplomatic and

commercial decryption for the Government Code and Cipher School (GCCS) at Bletchley Park in wartime Britain and Lieutenant Little representing the Examination Unit in Ottawa, is worth reciting in its entirety:

> “Little and Denniston hit it off. The older man took a liking to the enthusiastic Canadian naval lieutenant and toured him around the London headquarters. ‘I was under the impression that a lot of people working on a great mass of material all over,’ Little later recalled. Denniston invited him down to his home for a weekend, and later where they sipped gin and talked cryptography. The result was a special gift to Canada. Denniston said that Britain would give Canada the decrypts of high-grade Japanese diplomatic traffic. This included the precious machine-enciphered (PURPLE) messages from the Japanese ambassador in Berlin …
>
> In return, Denniston, with Menzies’ approval, asked that Canada continue to monitor Japanese traffic but concentrate particularly on the Japanese diplomatic and commercial messages being received by the Point Grey station near Vancouver. The British were certainly trying to hear Tokyo themselves. The wireless intercept station at Brora, Scotland was tuned to no less than ten stations sending from Japan to Germany, but reception was incomplete. Denniston arranged through the Admiralty for the most promising traffic heard in Canada to be cabled to Britain as soon as received, while less urgent raw material – the commercial traffic – was to be packaged and sent via Ferry Command …”

> By coincidence, the Americans at this time made an almost identical offer. Within a few days of Little's return to Canada, a representative from the War Department told the Examination Unit committee that arrangements had been made to supply the British with 'messages of special secrecy' and it was prepared to do the same for the Canadians. It appears that the Americans … were now monitoring the Tokyo-Berlin half of the traffic involving Japan's diplomatic staff in Germany.
>
> The offer was so important that Robertson and [Lester Bowles] Pearson immediately accompanied the Prime Minister to London to clinch the deal."
>
> *Best Kept Secret*, p. 140-141

Immediately after this high level meeting in Washington, special high-speed wax drum recorders were installed at Station Point Grey to record the diplomatic signals being sent on the Toyo-Berlin circuit.

The recordings would find their way first to the Examination Unit in Ottawa (Canada's wartime cryptanalysis centre set up by Lester Bowles Pearson) and in turn to both Arlington Hall in Maryland and via the HYDRA transmitter at Camp X to Commander Denniston's and the cryptanalsysts at the Berkely street division of GCCS, where diplomatic and commercial traffic were handled.

An example of the valuable types of messages intercepted by Station Point Grey and decrypted under the 1942 Little- Denniston Agreement is found in Appendix A: A decrypted message of Oshima's May 27th, 1944 meeting with Adolph Hitler.

The Decision to Secure Fort Point Grey and Station Point Grey

In 2011 when I stepped forward to outline the matter of Station Point Grey to the President of the University of British Columbia, I decided to do some scholarship to bring myself up to speed on the latest information available in the public domain on the special intelligence work done at Station Point Grey.

In 2011 I read the 1993 book by John Bryden titled "*Best Kept Secret*". Bryden disclosed publicly and in some detail the Special Intelligence work the radio intercept site Station Point Grey did on the campus of the University of British Columbia did during the Second World War.

After the Japanese Imperial Navy (IJN) attacked Pearl Harbour in December 1941 and the Imperial Japanese Government declared war on the Canada and her allies, the Parliament of Canada made the decision to secure both Fort Point Grey and Station Point Grey by requiring all students of Japanese heritage, irrespective of nationality, to leave their studies at the University of British Columbia for the duration of the conflict with Japan.

The Imperial Japanese Navy had an extensive intelligence collection network along the western seaboard of North America, which caused hardships to allied shipping throughout 1942 and into 1943. The IJN also undertook attacks up and down the West Coast in 1942 and 1943.

The decision to secure UBC, Fort Point Grey and Station Point Grey was a wise and pragmatic decision by the Parliament of Canada. The President and Board of Governors at UBC in 1941 were asked to follow a rightful order under wartime regulations. These regulations remained in force until 1946 and wartime demobilization.

In 2011 UBC was pushed by a Political Action Group to confer honorary degrees to former students of Japanese heritage who were asked to leave the campus of the University of British Columbia in the weeks following the December 1941 attack on Pearl Harbour and the subsequent declaration of war by Imperial Japan on Canada.

There is an irony that a Political Action Group of Japanese heritage would be so critical of a group of professionals doing the work of good Samaritans who would in turn save the lives of so many millions of Japanese citizens, some of whom were related to the honorary degree recipients.

The Special Intelligence Gathered at Station Point Grey Saved Lives

In the last year of the Second World War one million people were dying each month.

The Special Intelligence gathered at Station Point Grey helped to shorten the duration of the Second World War by upwards of two years, and helped to save the lives of perhaps of 30 million non-combatants, many of whom were from Asia, and many of whom were in fact Japanese.

It was evident to me that in conferring these honorary degrees in 2011 the University of British Columbia erred in matters of scholarship and in matter of law.

References:

[1] John Bryden, *Best Kept Secret: Canadian Secret Intelligence in the Second World War*, Lester Publishing Ltd. Toronto, 1993

[2] This map comes from http://www.petrowilliamus.co.uk/pointgrey/war.htm

[3] These pictures from private collections of radio operators who worked at Station Point Grey. For instance, http://www.spectralumni.ca/MS_Point%20Grey.htm

[4] The story has to how Dr. Frederick Kaempffer would leave Gottingen and become a professor at the Physics Department can be found in the article George Michael Volkoff, the University of British Columbia and the TRIUMF Project at archive.org.

Appendix A: A decrypted message of Oshima's May 27th, 1944 meeting with Adolph Hitler (declassified by the NSA, the successor to Arlington Hall, in May 1980)

WAR DEPARTMENT

~~SECRET~~

From: Berlin (OSHIMA)
To: Tokyo
28 May 1944

#511, 7 PARTS COMPLETE. Strictly Secret.

PART 1: Re My Message #508[a].

The following, in sum, is what Chancellor HITLER said:

1. "Where the battle is now acute is the Italian Front. Against that quarter, England and America have stacked an infinitude of weapons and materials and embarked on a drive. Nevertheless, to my view, the main object of this drive is to lure German military strength to that quarter; therefore, Germany will not count too highly the loss of more or less territory. We are putting up very stiff resistance and while inflicting huge losses on the enemy, we are retiring. Since the military situation in Italy depends much on the enemy's superiority in the air, it would be an effective measure for Germany to send in aerial reinforcements, but in this matter other military theatres are concerned and we are refraining from doing so. ~~For some time Germany has used the Appenine range, and with a view to maintaining the Italian front,~~ Originally, with a view of using the Appenine range and of maintaining the Italian front, Germany ~~[illegible]~~

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established a powerful position ~~here~~ There, but we realized that from the point of view of expediency, ~~realizing that~~ it was necessary to defend Rome. So, south of that city, on a line ~~reaching~~ running from the Alban ~~vicinity~~ neighborhood past a point ~~of Rome~~, ~~running~~ south of Gransasso to ~~a point~~ The north of Pescaro, we ~~have~~ formed a ~~position~~ certain line which we call "Position C", and with the idea in mind that I have already described, while inflicting as much damage as possible on the enemy, we will retire to this line.

PART 2:

2. The temporary ease on the Eastern Front now continues, but I am thinking that before long the Soviet will charge. For the time being, Germany has taken the steps necessary to attain the object of staving it off. The Hungarian army also has already sent seventeen divisions to the front. Romania, too, has practically the same number on Line #1. In view of past experience, Germany saw proper to place some of her finest divisions, particularly armored divisions, among these foreign troops. Despite the fact that the defense of Europe we realized had best be exercised at the River Don, neither Hungary nor Romania understood this. However, this time more concern seems to be expressed on their faces than before because the flames are now close

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to their own borders. So far, they have come out rather well."

I then asked, "What course do you judge that the Soviet drive will follow?", and HITLER answered, "Two. I think that they will head northwest from the Lemberg area and penetrate into the General Government by which I mean Central Poland, and also invade Romania. I think that the drive from the Lemberg quarter will come first, and then an attempted invasion of Romania," and further explained, "As I told you the last time, I am not satisfied to stay on the defensive forever and when I see my chance I intend to turn to the offensive again."

PART 3:

3. Speaking of the Second Front, HITLER said, "I believe that early or late an invasion action will be carried out against Europe. On the British Isles there are already about eighty divisions of men gathered together, I believe." (Actually among them, there are a mere eight divisions of real fighting men that have experience in actual warfare.) I then asked, "Does Your Excellency believe that these Anglo-American forces are fully prepared to invade," and

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HITLER answered, "Yes.". I waited for a moment and went on, "I wonder what ideas you have on how the Second Front will be carried out," whereupon HITLER answered, "Well, as for me, judging from relatively ominous portents, I think that Ablenkungsoperazionen(diversionary actions) will take place against Norway, Denmark, the southern part of western France, and the coasts of the French Mediterranean--various places. After that, after they have established bridgeheads on the Norman and Brittany Peninsulas and seen how the prospect appears, they will come forward with the establishment of an all out Second Front in the area of the Straits of Dover. As for Germany, it would be most desirable, if a chance were to be had, to smite them in as brief a time as possible, but if the enemy does what I have just described, their men will be dispersed. Expecting this, we intend to finish off the enemy's men in many spots." Then he continued, "The number of German troops in the west, just as the last time, make up about sixty divisions.

PART 4:

4. To this I said, "I, too, figure that the signs point toward the coming of an invasion sooner or later by

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the Anglo-Americans. Since the enemy apparently intends to take this step, or even if perchance he does not, there is much to think about. During my last conversation with you, you told me that in case they did not come you thought you might blast southern England, using rocket guns and find an opportunity to take the initiative again on the Eastern Front. Well, since then, the Anglo-Americans have been bombing this area stronger than ever and I wonder if these instruments you were going to shoot at England with have not been destroyed." HITLER answered, "No, these guns are in an arsenal made of impermeable concrete. They are in no danger." Again I spoke up, "If the Anglo-Americans do not stage an invasion, don't you think it would be a little dangerous to return your troops to the Eastern Front?" HITLER answered, "Well, I have no intention of waiting forever for them to come. I will give them two or three months more time but if they don't come then, Germany will take the offensive. By that time, adding the ones we have now finished organizing and equipped, we will have between 60 and 70 divisions. (I seem to remember that he said that 45 of them were armored divisions.) Then we will be able to take the offensive."

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(Also he said that he had exceeded his plans for organizing S.S. divisions and that 25 of them had already been practically organized and equipped.)

PART 5:

Pursuing, I pointed out to him the past record of the German-Soviet war and went on to say, "The line where both the German and Soviet armies now face each other, leaving out the three Baltic nations, is just about what it was when this war started. For you to go ahead and repeat a drive with the same idea in mind that you have always had, could not, would not after all decide that conflict. I think that you ought to adopt another view of some sort, and wage an action like that of Cannae long ago. What does Your Excellency think of that?" HITLER paused a moment and continued, "To tell you the truth, the Soviet striking power has more or less weakened. Soviet manpower is now, generally speaking, on the front line about 700 and on the second line about 200 divisions, so it is said, but let us stop to consider its makeup. A whole lot of these divisions are not even up in strength to [illegible] mere regiments, in my opinion. The same is true of their equipage. The quality of their infantry has deterior-

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ated extremely, but the ~~cavalry~~ artillery and tanks are excellent. Following their experience in real warfare, their use of great groups of ~~cavalry~~ artillery has increased tremendously, and speaking of the calibre of their shells, although they are in no wise tehhnically superior to ours, since they use large amounts of various materials like tungsten and molybden, they are qualitatively superior to ours. Their tanks, particularly T-34's, in view of the nature of the terrain on the Eastern front, are better than Germany's. The Tigers ~~lack weight~~ are excessively heavy, and in time of schramm (mud), they cannot be used. In some cases, we put sturmgeschütze, also, (I think I may translate this "assault guns") on the controls. The Panthers, too, are nothing more than of an experimental nature. They have had any number of kinderkrankheiten (minor defects.)

PART 6:

Recently, we have succeeded in improving them and in the Soviet, highly mobile field guns are absolutely necessary. Before long, we are going to attach a considerable number of assault guns to every unit and establish 45 assault gun brigades as general army reserves. We are gradually mak-

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ing progress. Moreover, principally out of consideration of our war with the Soviet, we have just ordered Speer to carry out our plans for increasing assault guns and tanks. By January of next year, it appears that we are likely to have a monthly output of 1,800 assault guns and 1,500 tanks. As for the Luftwaffe, although we are found numerically wanting since America entered the war, in the meantime, as a result of having concentrated on increasing fighter planes in particular, our monthly amount in September is scheduled to reach 6,000 and by January of next year, 8,000. (HITLER spoke of fighters, but I think he meant to include pursuit planes and Schnellbombers.) In the past, damage wrought by English and American air raids has indeed not been small, but as you know, most of it has been against dwellings in general and although innocent people have been killed and wounded and much material damage has accrued, harm wrought to factories and other production equipment is very light compared to that.

PART 7:

"The most important airplane construction equipment has already been put under ground for the most part, and in

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two months this work will be about finished, thus enabling us to reduce a step further the effect of air raids. And I expect that from now on the military situation will continue black for Germany, but at least this year we will gain an opening that will enable us to regain the initiative," so he added.

5. During this conversation Chancellor HITLER asked me about conditions in Greater East Asia, particularly the battle of India; how the battle of Honan was going; what our plans were; and what America's war strength and plans appeared to be. As I knew hardly anything about these things, I merely gave vague explanations. However, I told him that the Empire of Japan is now doing her very best to increase the output of airplanes and ships and that I believed that as we progressed in this enterprise, we would turn with a vengeance to the further prosecution of the war.

In this message there are points which have to do with Germany's future schemes concerning the conduct of actions, so I want you please to be most careful to guard their secrecy.

a - SSA #124309.

Inter 29 May 44 (2) Japanese #124402
Rec'd 29 May 44
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History

The Birth of BSC by H. Montgomery Hyde

BSC means British Security Coordination

(Chapter Two from *The Quiet Canadian: The Story of the British Intelligence Center in New York during World War II* – also published under the Title Room 3603)

1

STEPHENSON'S return to New York,, this time with his wife, coincided with the evacuation of the remaining British forces from Dunkirk and the drawn-out agony of the French military and political collapse. The new British Passport Control Officer found the atmosphere bleakly defeatist so far as Britain's chances of survival went. This was the view of many of the President's influential advisers, encouraged by the two principal American Ambassadors abroad,, William Bullitt in Paris and Joseph Kennedy in London, the latter constantly and vehemently counselling the President against *'holding the bag in a war in which the Allies expect to be beaten'*. (Robert Sherwood. The White House Papers of Harry L. Hopkins (1948)- I, 151-2.) But it was not Stephenson's view. 'The arsenals of Britain are empty', he told Roosevelt when they met at this time, 'but she will win out. The British do not kneel easily. 5 Meanwhile Roosevelt, though continuing his intimate correspondence with Churchill, had been obliged to refuse the Prime Minister's repeated requests for American destroyers on the ground

that this would require the assent of Congress and that the time was not opportune.

For some years the Passport Control Officer had been accommodated in a small room in the British Consulate-General in down-town Manhattan with a staff consisting of one assistant and a woman clerk and secretary. Stephenson took one look at this accommodation and saw that it was totally unsuitable for his own base headquarters and the kind of intelligence organization which he contemplated. It was his first and only visit to the cramped and depressing offices in Exchange Place. Until he could lease suitable office space in a more convenient part of the city, he decided to work from the apartment he had taken in Hampshire House overlooking Central Park.

Next he flew down to Washington and reported his arrival to Lord Lothian at the British Embassy. He found the Ambassador sympathetic and helpful and thoroughly familiar with the local political scene, but also frankly worried. Lothian had just received a cable from Churchill urging him to see the President and impress upon him what would happen if Britain broke under a German invasion and a pro-German Quisling type of Government in Whitehall were induced by the prospect of easier peace terms to surrender the British Fleet. 'You should talk to him in this sense', Churchill had said, e and thus discourage any complacent assumption on the United States' part that they will pick up the debris of the British Empire by their present policy. On the contrary, they run the terrible risk that their sea-power will be completely over-matched. Moreover, islands and naval bases to hold the

United States in awe would certainly be claimed by the Nazis. If we go down Hitler has a very good chance of conquering the world.' (1 Churchill. II, 355.)

On the night of June 16, 1940, Lothian was summoned to the White House where he saw the President with Sumner Welles, the Under-Secretory of State. The news had just come in that the French Premier Paul Reynaud had resigned and had been succeeded by the Petain-Weygand Government which had begun negotiations with the Germans for an armistice. After saying he thought Churchill's telegrams to Reynaud, urging that the French Fleet sail forthwith to British harbours pending negotiations, were 'perfectly grand', the President went on to express the hope that as many French airmen and others would assist in carrying on the war in Algiers or with the British, as also that, *if ever a similar crisis arose in Great Britain, the war would be carried on overseas and that the British Fleet would not be surrendered.* To this Lothian replied that Great Britain could not be expected to transfer her Fleet across the seas and associate it with any country that was not going to use it and its own resources to the limit to rescue Great Britain herself from conquest.

President Roosevelt then told the Ambassador that, so far as he had thought out the position, he considered that, in the event of Britain becoming useless as a naval base, the Fleet ought to be withdrawn to Capetown, Singapore, Aden and Sydney, while the main American navy reinforced the Atlantic and undertook the defence of Canada and other British possessions. He added that, if the crisis reached this point, the United States would certainly

allow British ships to use American facilities for reforming and supply, and that, while they might not have formally declared war on Germany because of constitutional difficulties, they would in effect be a belligerent 'assisting the Empire in every way and enforcing the blockade on Germany'. This tremendous decision to back the seemingly hopeless cause of Britain with all the material and moral encouragement he could supply was entirely Roosevelt's own; it was taken against the advice of the majority of the White House official circle, and at a time when his position in the country in an election year was far from secure. He immediately followed it up by giving his Cabinet a new bi-partisan look, having anticipated over the past six months that the development of e a real crisis' in the shape of a German victory in Europe would justify him in largely dispensing with what he called c strictly old- fashioned party government'. He accordingly dismissed the isolationist Secretary of the Navy and his colleague in the War Department, replacing them with leading Republicans who were powerful advocates of American intervention in the European struggle and strongly pro-British. Frank Knox, Boston-born proprietor of the *Chicago Daily News*, whom Roosevelt considered of all the Republican leaders to 'have shown a truer understanding of the effect which the International situation will of necessity exert on our domestic future' he had been the Republican nominee for Vice-President in the 1936 election became Secretary of the Navy, while the veteran New York lawyer, Henry L. Stimson, who had been Secretary of War under President Taft nearly thirty years before, returned to that office at the urgent invitation of Roosevelt, because in Stimson's words 'everybody was running around at loose ends in Washington and he (Roosevelt) thought I would be a stabilizing factor in whom both the Army and the public would

have confidence'. (Henry L. Stimson and McGeorge Bundy. On Active Service in Peace and War (1952), 144.) At first the President seriously considered appointing another Republican, the fifty-seven-year- old ‘Wild Bill’ Donovan, to this important post, but after reflection decided to keep him for other duties. This was to prove a most fortunate decision for Anglo-American co-operation in the joint prosecution of the war.

William Joseph Donovan, whom Stephenson had first met during a visit to England and with whom he now lost no time in renewing acquaintance, was an Irish-American of truly dynamic character. He could be fairly described as a big man in every way, with great generosity of spirit, many enthusiasms and considerable breadth of interests. The son of a poor family of Irish immigrants in Buffalo and a Roman Catholic who neither smoked nor drank alcohol, Bill Donovan was entirely self-made, having risen by what is known in America as 'the hard way' to become a most successful New York City lawyer with offices in Wall Street, and Acting Attorney-General under President Coolidge. It was his service with the famous 'Fighting 69th' in the First World War which had earlier earned him the Congressional Medal of Honour and also the title of 'Wild Bill’. (This was to some extent a misnomer since he was by nature an extremely modest person.) It had been generally thought that Herbert Hoover, for whom he had campaigned actively in the 1928 Presidential Election, would make Donovan Attorney-General on reaching the White House, but the appointment was blocked by e dry 5 elements in the Republican Party, to whom the idea of a member of a community with such 'wet' interests as the Catholic Irish-American was obnoxious, although Donovan himself was a teetotaller. After being defeated

in the election for the Governorship of New York on the Republican ticket in 1932 he was successful in everything except politics Donovan had returned to his law practice, which he would periodically leave in the hands of his partners to visit Europe, touring the battle fronts in the Italo-Abyssinian campaign and the Spanish Civil War where he viewed with alarm the rise of Fascist power. Although belonging to opposing political parties Donovan and Roosevelt were old friends from Columbia Law School, where they had been classmates together. 'Frankly I should like to have him in the Cabinet', the President had told Frank Knox at the end of 1939, 'not only for his own ability, but also to repair in a sense the very great injustice done him by President Hoover …. (The Roosevelt Letters. Ed. Elliott Roosevelt (1952). Ill, 297). In fact, Donovan was now to become President Roosevelt's roving ambassador in Europe and later chief of all United States secret intelligence and *'Special Operations*' overseas.

Speaking many years later, in the privacy of his New York apartment, Stephenson was to recall the vital significance of initial contact with Donovan at this period. 'The procurement of certain supplies for Britain was high on the list', he said, 'and it was the burning urgency of the attempt to fulfil this requirement that made me instinctively I don't think it can be rated much higher than that concentrate on a single individual who, despite all my contacts in high places, might achieve more than any widespread effort on the official or sub-official levels which had so far been unproductive. My assessment was proved correct in the event. Donovan, by virtue of his very independence of thought and action, inevitably had his critics, but there were

few among them who would deny the credit due to him for having reached a correct appraisal of the international situation in the summer of 1940.

> “At that time the United States Government was debating two alternative courses of action', Stephenson continued; 'one was to endeavour to keep Britain in the war by supplying her with material assistance of which she was desperately in need; the other was to give Britain up for lost and to concentrate exclusively on American rearmament to offset the German threat. That the former course was eventually pursued was due in large measure to Donovan's tireless advocacy of it. Immediately after the fall of France not even the President himself could feel assured that aid to Britain was not to be wasted in the circumstances. I need not remind you of the despatches from the Ambassadors in London and Paris stressing that Britain's cause was hopeless, and the majority of the Cabinet here was inclined to the same conclusion, all of which found vigorous expression in organized isolationism with men like Colonel Lindbergh and Senator Wheeler. Donovan, on the other hand, was convinced that granted sufficient aid from the United States, Britain could and would survive. It was my task first to inform him of Britain's foremost requirements so that he could make them known in the appropriate quarters, and secondly, to furnish him with concrete evidence in support of his contention that American material assistance would not be improvident charity but a sound investment.”

Donovan's immediate reaction on hearing from Stephenson was to arrange a meeting with Knox and Stimson, at which both he and Stephenson were present. At this meeting the main subject of discussion was Britain's urgent need of destroyers, and various ways and means were explored for a formula to cover the transfer of forty or fifty of the old Tour-stackers', then in cold storage, to Britain, without infringing the American neutrality law and without affronting American public opinion in which ships of the navy have a special sentimental value. Knox pointed out that under the present law such a transfer could only be made against a quid pro quo which represented such an obvious increase in American security that the Administration could safely transfer to a foreign power part of its naval forces. Even so, the transaction on a narrow interpretation of international law might be held to be a breach of neutrality. The only hope seemed to lie in being able to convince the President that he could sanction such an arrangement by executive decree, for in its present mood Congress if consulted would certainly reject it.

Besides the destroyers, Churchill had asked urgently for light naval craft, first line aircraft, including flying boats, and military equipment and supplies. Stephenson thereupon suggested that Donovan should pay a visit to Britain so that he would be in a position to give the President a first-hand report, having seen for himself what conditions were like and what were the country's chances of success against Hitler.

Donovan welcomed the idea, and with strong support from Knox it was referred to the President who immediately agreed that Donovan should make the trip and that he should travel as his unofficial personal representative.

2

Encouraged as it was by Stephenson, Donovan's visit to England, which took place between mid-July and early August, 1 940, proved most fruitful. “I arranged that he should be afforded every opportunity to conduct his inquiries', Stephenson recalled afterwards.

> ‘I endeavoured to marshal my friends in high places to bare their breasts. He was received in audience by the King, he had ample time with Churchill and members of the Cabinet concerned. He visited war factories and military training centres. He spoke with industrial leaders, and with representatives of all classes of the community. He learned what was true that Churchill, defying the Nazis, was no mere bold facade but the very heart of Britain which was still beating strongly.'

One person Donovan did not see in London was the defeatist Ambassador Joseph Kennedy who by a calculated snub was not advised by the White House of Donovan's tour. However, he did see a number of American naval, military and army air force observers, who were attached to the Embassy. The latter included Lt.-Colonel (later General) Carl Spaatz.

> 'The story goes that the naval and army observers, when asked what they thought of the British chance of survival, replied they had not got a hope. Lt.-Colonel Spaatz, on the other hand, said that he and the army air force observers were convinced that the British would pull through because the Germans could not beat the R.A.F. and they would not invade until they had. Colonel Donovan went back to the United States and reported these observations, recommending the transfer of the destroyers to Great Britain.' (John G. Winant. A Letter from Grosvenor Square (1947), at p. 35.)

At the end of July, on the eve of Donovan's departure from London, Churchill made a final appeal to Roosevelt for the destroyers:

> 'Mr. President, with great respect I must tell you that in the long history of the world this is a thing to do now … If the destroyers were given, the motor-boats and flying-boats, which would be invaluable, could surely come in behind them. I am beginning to feel very hopeful about this war if we can get round the next three or four months. The air is holding well. We are hitting that man hard, both in repelling attacks and in bombing Germany. But the loss of destroyers by air attack may well be so serious as to break down our defence of the food and trade routes across the Atlantic.' (Churchill. II, 356-7).

This brought matters to a head in Washington, where at a Cabinet meeting held in the White House on August 2, to quote the President's own words, It was the general opinion, without any dissenting voice, that the survival of

the British Isles under German attack might very possibly depend upon their getting these destroyers'. Ways and means were discussed of conveying the destroyers to Britain by some form of direct or indirect sale. Roosevelt, who still felt that legislation was necessary for any such plan, thought that a British pledge that the Royal Navy would not fall into German hands, in the event of German success, but would sail for North American or Empire ports 'where they would remain afloat and be available', would greatly lessen opposition in Congress, and he proposed to sound out Mr. Wendell Willkie, who had just received the Republican Party nomination for President. (Roosevelt III, 326) In fact, Willkie did give assurances that he would not make a campaign issue of the proposed transfer. Churchill, on the other hand, was reluctant to give any public pledge which, contemplating as it did the fall of Britain, would be most damaging to the morale of his people. Fortunately, with the return of Donovan and his reports to the President and Knox, the emphasis on the consideration for the transfer shifted to naval and air bases.

'Donovan greatly impressed by visit', Stephenson cabled London on August 8. ' … Has strongly urged our case re destroyers and is doing much to combat defeatist attitude in Washington by stating positively and convincingly that we shall win.' As a lawyer Donovan argued that there was no need for the President to submit the plan to Congress, on the ground that it was, broadly speaking, an exercise of the traditional power of the Executive in foreign affairs, and in this he was vigorously supported in the Cabinet by Stimson and Robert Jackson, the Attorney-General, and outside by Dean Acheson, the future Secretary of State, and a group of influential

New York lawyers. The President was soon converted to this view, and on August 13, at a meeting with Knox, Stimson, Welles and Morgenthau, he drafted the essential principles of the so-called destroyers for bases deal, which now belongs to history. ‘I think the trick has been done', noted Lothian on August 16. 'At least the President told me on the telephone this morning that he thought it was. Donovan helped a lot, and Knox.' (Roosevelt. Ill, 32?- J- R- M. Butler, Lord Lothian (1960), 297- For detailed accounts of the transaction, see Churchill, 11, 353~o and Mail, 1 39-45 9 n the British side, and Cordell Hull, I, 831-43, and Stimson and Bundy, 169-71, on the American side.)

Owing to what Stephenson described at the time as 'strong opposition from below and procrastination from above', three weeks were to elapse before the agreement was formally concluded. During this period the stage was principally occupied by discussions between Lothian, Welles and Knox, with Stephenson and Donovan playing strong supporting roles in the wings. On August 21, Stephenson informed London by cable:

> “Donovan has urged upon President to see promised matters through himself with definite results. Donovan believes you will have within a few days very favourable news, and thinks he has restored confidence as to Britain's determination and ability to resist.”

In fact it was at midnight on the following day that Stephenson was able to report that the figure of fifty destroyers had been agreed by the President and that forty-four were in commission for delivery. On September 3, legal

effect was given to the deal by an exchange of notes between Lothian and Cordell Hull, the Secretary of State. The exchange is a big thing', said Lothian at the time:

> ‘It really links U.S.A. and the British Empire together for defence.' (2 Butler. 298).

It provided for a ninety-nine-year lease of British bases in the Caribbean in exchange for the fifty destroyers, a similar lease of bases in Bermuda and Newfoundland freely granted, and a personal reaffirmation to the President of the statement which the British Prime Minister had already made to Parliament that the Royal Navy would not in any circumstances be surrendered to the Germans or sunk.

> 'Thus we obtained the fifty American destroyers … and both countries were satisfied/ wrote Churchill afterwards. The effects in Europe were profound.' (Churchill II, p. 368).

In Stephenson's view, which he communicated to headquarters in London, this historic agreement could certainly not have eventuated when it did without Donovan's intercession, and in recognition of this fact Stephenson was instructed to thank him on behalf of His Majesty's Government. During the same period and by the same means, there were other essential supplies which Donovan was largely instrumental in obtaining for Britain at this time, among them a hundred Flying Fortresses and a million rifles for use by the Home Guard in the event of a German invasion. Moreover, when

Donovan was in London, Lord Beaverbrook, the Minister of Aircraft Production, had asked for particulars of the secret American Sperry bomb-sight, which he wished installed on British bombers operating over Europe. On his return to Washington, Donovan had urged on the President and Knox that the bomb-sight should be made available. At first they objected, pointing out with good reason that if employed in the manner contemplated the bomb-sight would sooner or later be bound to fall into enemy hands. Fortunately Stephenson was able to overcome this objection by advising Donovan, on the basis of recent British secret intelligence, that the Germans already possessed details of the invention. (Drawings of the bomb-sight, or one similar to it, had been sold to German agents in 1938.) On September 24, 1940, Stephenson cabled London: "President has sanctioned release to us of bomb-sight, to be fitted henceforth to bombers supplied to us/ In fact, the Sperry bomb-sight was released a few days later, and forty sights were immediately provided from stock. (Hall. P. 191.)

Stephenson has described his work with Donovan at this period as 'covert diplomacy inasmuch as it was preparatory and supplementary to negotiations conducted directly by H.M. Ambassador'. At first consideration it may seem that this work was far removed from the secret intelligence and special operations with which he had been primarily charged, and indeed that it necessitated, since it was strictly a personal undertaking, no organizational machinery of any kind. But the truth is that whatever he was able to accomplish in the way of obtaining certain essential supplies during the fateful summer of 1940 was largely assisted by his connection with both secret intelligence and political warfare activities.

For example, it would in all probability have been impossible for Stephenson to overcome the objections raised to releasing the Sperry bomb-sight to Britain, had he not had ready access to secret sources of information. Again, Donovan would certainly have found it considerably more difficult to achieve success in his negotiations if Stephenson had not had means at his disposal for influencing American public opinion. In fact, covert propaganda, one of the most powerful weapons which Stephenson and the organization which he was slowly building up employed against the enemy, was directly harnessed to this task. Thus, General Pershing had been persuaded through the good offices of an intermediary, a wealthy American business man named Albert Younglove Gowen, who was a friend of both Stephenson and the General, to come out with a strong speech early in August supporting the destroyers deal. Since Pershing was a national hero and was known to have no political ambitions or party affiliations, his voice carried great weight in the country. (*New York Herald-Tribune*, August 5, 1940). Then, Donovan himself on his return from London wrote a series of articles in collaboration with a newspaperman, Edgar Ansel Mowrer, on 'German Fifth Column Tactics', based on material supplied by Stephenson from British secret intelligence sources. The articles, which created a great stir, were originally published in the influential *Chicago Daily News* owned by Frank Knox, the Secretary of the Navy, and reproduced in many other newspapers throughout the country, including the *New York Herald-Tribune*. They were also the occasion for a broadcast talk by Donovan over a nation-wide 'hook-up', the first ever afforded to a speaker other than the President.

Finally Knox himself wrote an article summing up the series. (*New York Herald-Tribune*, August 20-24, 1940)

3

The United States Government's conviction of the wisdom in principle of providing Britain with material aid was reflected in a telegram which Stephenson sent to Intelligence Headquarters in London on September 14, 1940: ‘Our American friends desire guidance as to what requirements in addition to Flying Fortresses they may assist to fulfil.' For the next few weeks President Roosevelt could give the subject little personal attention as he was engaged in the election campaign, which resulted in his triumphant return to the White House for a third term at the beginning of November. However, once the election was out of the way, and he had taken a short holiday cruise, the President bent all his energies to the task of helping his British friends. Churchill had told him that Britain was coming to the end of her dollar resources with which to purchase supplies in America, and this prompted the President, at his first press conference on returning from his cruise, to put forward the conception of lend-lease, using the simple and homely analogy of lending a neighbour a length of hose with which to fight a fire. He followed this up with his famous 'fireside chat' on the radio, in which he told the American people that 'we must produce arms and ships with every energy and resource we can command' and that c we must be the great arsenal of Democracy'. After a two-month struggle in Congress, the Lend-Lease Bill which empowered the President to 'sell, transfer, exchange, lend, lease or otherwise dispose of defence materials for the Government of

any country whose defence the President deems vital to the defence of the United States', eventually became law, in spite of violent opposition led by Senator Burton K. Wheeler and other members of the 'American First' organization who claimed that its enactment would mean 'ploughing under every fourth American boy on foreign battlefields for the benefit of a decayed British Empire'. (Churchill. II, 495)

Stephenson's immediate task of helping with essential supplies was now accomplished, or rather it became inextricably a part of the broader purpose of promoting American sympathy, to which in turn his intelligence and propaganda activities were initially directed. In pursuing that purpose Donovan's cooperation continued to be of inestimable value. Although some of the more important services which Donovan rendered Britain at this time were outside Stephenson's sphere of operations, nevertheless they deserve some mention here as one of the results of his liaison with Stephenson and also because they have not hitherto been described.

During the autumn and early winter of 1940, Mr. Churchill was especially concerned to secure the assistance of the United States Navy in convoying British merchant ships across the Atlantic. At this time there were two German armed raiders and the pocket battleship Scheer roaming the seas and the resultant losses to British shipping were constantly mounting. In the five weeks ending November 3, 1940, as the Prime Minister told the President in a letter seeking this protection, the losses reached a total of 420,300 tons. (Churchill. II, 495) However, this was a measure of assistance which the

Americans were at first reluctant to extend for fear that the Germans would regard it as an excuse for declaring war on the United States.

Stephenson discussed the problem at length with Donovan, whom he had little difficulty in persuading, first that it seemed unlikely on the basis of the evidence available that Germany would be provoked into a war with the United States by anything short of direct aggression, at least until she had defeated Britain, and secondly, that for the American Navy to participate in convoy duty should be regarded as an essential step in the United States policy of playing for time, that is to say, in the policy of enabling Britain to keep the enemy at bay until American preparedness was sufficiently advanced to meet the German challenge.

Donovan himself advanced these arguments at a conference with Knox, Stimson and Hull, who were impressed by them but felt they needed more concrete evidence before they could take action, particularly evidence supporting the contention that the necessity of agreeing to the British proposal outweighed the inherent risk in so doing. To obtain such evidence, Donovan proposed that he should pay another visit to London and go on to the Mediterranean, where the danger to British shipping and communications had recently been increased by the Italian invasion of Greece. This time it was agreed that Donovan should travel officially as representing the Navy Department. Before leaving, Stephenson, who flew as far as London with him, cabled Intelligence Headquarters that it was impossible to over-emphasize the importance of Donovan's visit. ‘He can play a great role, perhaps a vital one, but it may not be consistent with

orthodox diplomacy nor confined to its channels'. Stephenson pleaded. 'You should personally convey to the Prime Minister that Donovan is presently the strongest friend we have.'

After being delayed by bad weather for nearly a fortnight in Bermuda, they reached London about the middle of December. Here they had talks with Churchill and others who, in Stephenson's words, 'appreciated the significance and potentialities of this second visit of one who had justified my "build up" for him prior to his first visit'. The Prime Minister arranged for Brigadier Vivian Dykes, one of the Assistant Secretaries to the Cabinet and a brilliant military planner, to accompany Donovan to the Middle East (Dykes was killed in an air accident in 1943). Then Stephenson got the Director of Naval Intelligence at the Admiralty to send a signal to Admiral Cunningham, the Commander-in-Chief, Mediterranean Fleet, on the subject of Donovan's tour, 'which made it abundantly clear to the Admiral and his staff that Donovan was the most important emissary that they were ever likely to meet in this world or the next" , as Stephenson put it afterwards. 'I know', he added, 'because I dictated every word of it myself in the presence of the D.N.I. in his office.'

The following is an extract from this signal:

> Donovan exercises controlling influence over Knox, strong influence over Stimson, friendly advisory influence over President and Hull … Being a Republican, a Catholic and of Irish descent, he has following of the strongest opposition to the Administration. ... It was Donovan

> who was responsible for getting us the destroyers, the bomb-sight and other urgent requirements … There is no doubt that we can achieve infinitely more through Donovan than through any other individual … He is very receptive and should be made fully aware of our requirements and deficiencies and can be trusted to represent our needs in the right quarters and in the right way in the U.S.A.

Donovan was greatly impressed by the reception which Stephenson had arranged for him, saying afterwards that 'he had never been treated in such royal and exalted fashion and that the red carpet had been thicker and wider than he thought it was possible to lay'. Among others he had talks with Admiral Cunningham and General Wavell, who commanded the British naval and land forces respectively in the area, and as a result he was convinced that American supplies must be made abundantly available if Britain's important strategic position was to be held. On January 28, 1941, Churchill sent a message to Roosevelt thanking him for the 'fine work' which Donovan had done in the Middle East (Churchill. Ill, 24).

At Churchill's suggestion, Donovan with the President's approval agreed to extend his tour to Bulgaria and Yugoslavia. The Prime Minister was anxious to find some means of upsetting Hitler's timetable for the subjugation of the Balkan countries, which would have the effect of postponing even by a few weeks his contemplated attack upon Russia. This attack, which Churchill had learned of from intelligence sources, had been planned for May 15. As a result very largely of Donovan's actions it did not take place until June 22.

Donovan went first to Sofia. He could not dissuade King Boris and the Bulgarian leaders from their pro-German policy, but he did succeed in implanting in their minds a measure of doubt as to the wisdom of that policy. Consequently they hesitated before allowing German troops unrestricted passage through their country so as to prevent the British forces from obtaining a foothold in Greece. The British Prime Minister had intimated that he would be content with a delay of twenty-four hours. Donovan secured a delay of eight days. (Bulgaria adhered to the Axis Tripartite Pact (Germany, Italy, Japan). On March I, 1940, and German troops immediately began to occupy the country and to move towards the Greek border) During this visit Donovan was shadowed by German agents, who even followed him into the Royal Palace, where they relieved him of his passport and other papers, although they found nothing compromising.

When he reached Yugoslavia, Donovan found the pro-German Regent Prince Paul and his craven Government on the point of adhering to the Axis Powers. C I think we should find some means of getting across to the Prince Regent and others that the United States is looking not merely to the present but to the future', Roosevelt had written to Belgrade, 'and that any nation which tamely submits on the grounds of being quickly overrun would receive less sympathy from the world than a nation which resists, even if this resistance can be continued for only a few weeks … Our type of civilization and the war in whose outcome we are definitely interested, will be definitely helped by resistance on the part of Yugoslavia and almost automatically resistance on the part of Turkey even though temporarily Yugoslavia and

Turkey are not successful in the military sense.' (Roosevelt. Ill, 356 (memorandum dated February 20, 1941)).

Donovan did his best to get these views accepted, but he found that the Prime Minister, Dr. Cvetovic, and the Foreign Minister, Mr. Markovic, had already been summoned by Hitler to Berchtesgaden and committed their country to the Axis side. Only the Air Force General Simovic and a group of Serbian nationalist officers formed a clandestine opposition to German infiltration of Yugoslavia. Donovan accordingly visited Simovic at the Air Force Headquarters across the river from Belgrade at Zemun, The General asked him whether Britain could hold out against the Nazis and whether the United States would enter the war. After warning Simovic that he was merely expressing his personal views, Donovan answered both questions in the affirmative. As a result of this meeting Simovic was persuaded to organize the revolution which shortly afterwards led to the overthrow of Prince Paul and his treacherous Ministers and their replacement by a patriot Government led by Simovic. (The Yugoslav Ministers signed the Axis pact in Vienna on March 25. The revolution in Belgrade took over two days later, and on April 6 the German armies invaded both Yugoslavia and Greece). Immediately Hitler heard this news – he countermanded an order moving three Panzer divisions from Romania to southern Poland, and postponed the German invasion of Russia for five weeks, while he turned his immediate attention to Yugoslavia and Greece. (Churchill. Ill, 320, 323).

Donovan returned to Washington on March 18, 1941. Next morning he had breakfast with the President, to whom he reported his findings. Roosevelt

was delighted to see him, as he had just received another message from Churchill thanking him for the 'magnificent work done by Donovan in his prolonged tour of the Balkans and the Middle East’. ('He has carried with him throughout an animating, heart-warming flame', Churchill. Ill, 97). At his breakfast-time meeting Donovan particularly urged the importance of sending war materials direct to the Middle East if the British forces were to hold Egypt. The President instructed him to consult with the Government departments concerned c to see what could be worked out’. He then promptly issued a proclamation to the effect that the Red Sea and the Persian Gulf were no longer combat zones from which American vessels were excluded by the Neutrality Act. Inside a week or two the ships were loading for Suez (Hull. II, 944). Convoy protection for British vessels in their hazardous Atlantic voyages followed soon afterwards.

At the President's request, Donovan again broadcast to the American people. His speech, which was widely publicized, was designed to create a favourable public atmosphere for the announcement of further measures of American intervention on the side of Britain. In essence it was a plea for the United States Government's policy of “enlightened self-interest”, delivered by a man who had had considerable share in shaping that policy with a little help from his *Quiet Canadian* friend.

4

While the task of building a secret organization in America had necessarily to be begun from scratch, Stephenson embarked upon it with four definite

advantages. The first was his liaison with Hoover and the F.B.I., which he had previously arranged and which, as will be seen, was an essential pre-requisite of his work. The second was his acquaintance with a number of convinced interventionists, particularly Colonel Donovan, who were in a position to influence both United States public opinion and Government policy. The third was the goodwill of the Canadian authorities, who could give him considerable assistance which he needed. The fourth was the support which he enlisted immediately upon his arrival in the United States of the British Ambassador, Lord Lothian, who in the circumstances of the moment, when Britain was critically dependent upon American aid but could make no move to solicit it openly without playing into the hands of the isolationists, fully endorsed the need for an organization which, though independent of the Embassy, in effect constituted a covert counterpart of it.

Philip Kerr, 11th Marquess of Lothian, whom an educated American described at the time of his appointment in 1939 as 'the first British Ambassador since Bryce who has been anything but a diplomatic clerk', was a man of most attractive and brilliant personality, with fluent and persuasive gifts of speech, in spite of somewhat erratic religious beliefs he was a Roman Catholic turned Christian Scientist (Dr. Abraham Flexner, cited by Thomas Jones in A Diary with Letters (1954) at p. 433). Indeed it was his insistence on summoning to his bedside a faith-healer from Boston instead of the Embassy doctor when he was suffering from a relatively minor ailment that was generally thought to have killed him. His sudden and unexpected death, which took place in Washington in December, 1940, came as a great shock to those who, like Stephenson, worked closely with

him, and he was mourned alike by Americans and his own countrymen. In the words of the U.S. Secretary of State, Cordell Hull,

> 'his outstanding ability, his willingness and readiness to grasp our point of view and to represent that of his own Government, and his pleasing personality, made him an unsurpassed medium through which to carry on relations between the two Governments' . (Hull. I, 874).

The American Government accorded him burial in Arlington National Cemetery, a rare honour reserved for only one other British representative during the war. (Field-Marshal Sir John Dill) Lothian was succeeded as Ambassador, after an interval, by Lord Halifax, with whom Stephenson worked amicably but neither so intimately nor so informally as he had done with Lothian.

The man whom Stephenson would have liked to see above all others in occupation of the handsome red-brick building in Massachusetts Avenue, Washington, which Sir Edwin Lutyens had recently designed as the new British Embassy, was his buoyant compatriot and friend Lord Beaverbrook. Indeed Stephenson did some quiet lobbying on his friend's behalf, and in 1941 he was to work hard in informal discussions with Mr. Averill Harriman, who had been sent to London as President Roosevelt's Special Representative with the rank of Minister, to further the project of Beaverbrook's appointment to the post; for, like Harriman, Stephenson was keenly aware, to quote his own words, that

> “Max was likely to achieve more with F. D. R. than Halifax, who was looked upon by the President as somewhat of a cold fish”.

Stephenson admired Beaverbrook with more than ordinary enthusiasm, and he would hotly denounce any of his detractors and there were many whom he happened to encounter during this period. 'Little Bill' was wholeheartedly on the side of what he called the c war winners', a category headed in Britain by Churchill and Beaverbrook and in America by Roosevelt and Donovan. In Stephenson's eyes, as also in the Prime Minister's, Beaverbrook in the role of Minister of Air craft Production was the great hero of the ‘Battle of Britain’, and his almost superhuman achievement in replenishing the fighter squadrons with new and repaired machines fully justified the place in the War Cabinet to which Churchill had appointed him at the beginning of August, 1940. This was his hour', as the Prime Minister afterwards wrote (Churchill. II, 287). Or, as Stephenson was to put it in characteristic language to the author of these pages,

> 'but for the tremendous pressure that Beaverbrook exerted in his dynamic way, who could say whether the pitifully few aircraft that were flyable at the end of the battle in the air might not have been a minus zero force?'

As an old and experienced fighter pilot himself, Stephenson shared Beaverbrook’s anxiety for the safety of his son Max Aitken in the battle, and also the father's pride in his son's record of conspicuous gallantry in the air.

He particularly liked the tribute paid by a Canadian newspaper, which described them both as busily engaged in reducing the disparity between the British and German air forces. 'The father builds British machines, while the son destroys the German ones.' (Cited by Tom Driberg in Beaverbrook (1956), at p. 257).

Another great war-time achievement of Beaverbrook, in Stephenson's estimation, was his 'personal triumph', in Washington in inducing President Roosevelt to 'paint with a very wide brush' at the commencement of the American war production programme. Indeed Stephenson considered this, at least as regards its long-term effects, to be even more important than his work at the Ministry of Aircraft Production in London, and Stephenson was to witness its execution at close quarters. ‘It fairly took my breath away/ he was to remark on learning of the President's specific production objectives for the year 1942 in respect of planes, ships, tanks and anti-aircraft guns, to the tune of fifty billion dollars, which he knew must tax the country's productive capacity to the utmost. In this Stephenson agreed with Beaverbrook's biographer and former employee, Mr. Tom Driberg, M.P., who was to write that 'probably nobody else, with his North American big-business background certainly no conventional, conservative Englishman could have talked round the hardest-headed and highest-powered industrialists in the United States. It was a feat that may stand for ever to his credit.' (Driberg. op. cit. p 273).

As Stephenson well knew, the President liked Beaverbrook and much admired his direct and positive methods in the then desperate situation that

required these methods. Thus Roosevelt would have given him a particularly cordial welcome, if he had been appointed as the successor of Lord Halifax in Massachusetts Avenue. But any prospects of such a move were frustrated by Beaverbrook's complete breakdown in health and his con sequent resignation from the British War Cabinet early in 1942. Hence Halifax was to continue to serve as Ambassador until the end of the war.

Besides helping to obtain the essential supplies, as has already been described, Stephenson's three primary concerns were to investigate enemy activities, to institute adequate security measures against the danger of sabotage to British shipping and other property, and to mobilize American public opinion in favour of aid to Britain. It was to fulfil these purposes- that his headquarters organization in New York was originally established by him on the thirty-fifth and thirty-sixth floors of the International Building in Rockefeller Centre (630 Fifth Avenue), opposite St, Patrick's Cathedral. At first it operated under cover of the British Passport Control Office, and was inevitably small, although it was to grow rapidly as necessity required and opportunity offered. Apart from an Assistant Passport Control Officer and a senior S.I.S. officer, who was sent out from London and whose assistance proved of great value, it was staffed exclusively by men and women whom Stephenson recruited after taking up his appointment. With one or two exceptions none of them had any previous experience of secret work, but were chosen by virtue of having held responsible positions in private or professional life or of possessing special knowledge which fitted them to undertake the various tasks involved. A number of officers and virtually all the secretarial staff were recruited in Canada.

At the same time agents in the field were recruited, with the object of penetrating enemy or enemy-controlled commercial concerns, propaganda groups and diplomatic and consular missions, and Stephenson sent representatives to such key points as Washington, D.C., Los Angeles, San Francisco, and Seattle. But he was also quick to realize that the scope of his investigations could not logically be confined to the United States, for in the general purpose of obstructing Britain's receipt of American material assistance, the enemy could both attack and be attacked at other points in the Western Hemisphere. Accordingly Stephenson established the closest liaison with the British Imperial Censorship, which had just sent out a detachment from England to Bermuda, where the American mail-carrying Clipper aircraft and ships were now calling on their voyages to and from Europe, and where the examination of these transit mails was to provide most valuable information on enemy activities of all kinds throughout America, north and south.

Mr. (later Sir) Edwin Herbert, an energetic solicitor, had recently been appointed Director-General of the Postal and Telegraph Censorship in London, and he lost no time in visiting Stephenson in New York. Complete confidence was established between them, a relationship which was shortly afterwards extended by Stephenson to two of the most experienced officers in censorship, the late Charles des Graz, Chairman of Sotheby's and his assistant, William Hill- Wood, of the London banking house of Morgan Grenfell, when they took charge of all British censorship operations in the Western Hemisphere on Herbert's behalf and established their headquarters

in New York. Similar liaison arrangements were made with the Canadian security authorities, notably the Royal Canadian Mounted Police. Finally, Stephenson was put in direct communication by London with the existing British secret intelligence network, such as it was, in Latin America. But he soon discovered that most of these agents were hardly better equipped for their work than the Passport Control Office in New York had been at the time of his first arrival. Stephenson therefore proceeded to reinforce the Latin-American organization by despatching representatives of his own to all the important centres in Mexico and Central America.

In these early days of their collaboration Edgar Hoover and his F.B.I. could not have been more co-operative. Clearly Stephenson's growing organization, employing as it did not only its own intelligence agents but what amounted to its own police force for the special protection of British property, represented an obvious threat to United States neutrality and could not have existed at all without the F.B.I.'s tacit approval. But Hoover was more than its licensor. He was in a very real sense its patron. He suggested its cover name, British Security Co-ordination. Furthermore, he placed at Stephenson's disposal the F.B.I. wireless channel which for many months was to provide B.S.C. with its only safe means of communication with London headquarters. On a personal basis he worked very closely with Stephenson to further what was then the wholly un-neutral purpose of protecting and furthering British interests in the war against Germany and Italy, and he instructed his officers to assist B.S.C. in every way open to them. In short, Hoover led the F.B.I. into the fully fledged alliance with British Intelligence that the President had urged. The results of that alliance

are described in some detail later in this book. Meanwhile one or two examples, which belong to the early period of the Hoover-Stephenson collaboration, may conveniently be given here.

In October, 1940, Hoover learned through his agents that $ 3,850,000 worth of Italian funds, drawn from banks in the United States by the Italian Embassy in Washington, were to be sent to Latin America in Italian diplomatic bags. This information he discussed with Stephenson and they agreed that, while it might mean nothing more than a precautionary measure by the Italian Government against a possible 'freezing order' by the U.S. Treasury, there was a likelihood that the transfer was being made to finance subversive activities, particularly since the money had been drawn in bills of small denomination.

Accordingly they planned joint counter-action. Hoover arranged for the personnel of the Italian Embassy to be kept under surveillance, and, when the couriers left by plane, for F.B.I. agents to accompany them. There were three couriers in all, two consuls and an Embassy secretary. They travelled together as far as Brownsville, Texas, but there they separated. The consuls, who had $2,450,000 with them, went on to New Orleans, while the secretary, who had the balance of the money with him, boarded a train for Mexico City.

Stephenson now cabled this information to his representative in Mexico City for immediate action. The representative was able to arrange for the secretary's bag to be opened under the authority of the head of the Mexican

Police Intelligence Department, and the money which was found inside confiscated. Such action was, of course, a violation of diplomatic privilege. When the Italian Minister protested, which he did with considerable vigour, the Mexican Government apologized politely for the stupid and unfortunate act of c a new and inexperienced clerk'. However, it placed the money in a blocked account, thus rendering it useless for subversive activities. The incident was later used, both in Mexico and afterwards in the United States, as covert anti-Nazi propaganda.

Unfortunately the money being carried by the consuls escaped detention and control. British secret agents had made elaborate arrangements to purloin it at Pernambuco, but these were frustrated when the ship to which the couriers had transferred from New Orleans steamed on to Rio de Janeiro. Here the Brazilian Foreign Minister, forewarned of the arrival of the money, had agreed to give it his special protection; and, despite a subsequent assurance to an influential British contact in Rio that the money would be controlled, he kept his promise to the Italians by ensuring its safe delivery to their Embassy. This joint operation by Hoover's and Stephenson's men was, therefore, only partly successful. But it was sufficiently effective to discourage the Italians from any further attempts to transfer funds by covert methods to South America.

It speaks much for Hoover's courage and foresight that he was persuaded to co-operate so wholeheartedly with Stephenson. The very fact of his insistence upon knowledge of the liaison being kept secret from the State Department, as has been seen, showed that he was running a considerable

risk when he agreed to it. That risk was the chance that his connection with British Intelligence would be exposed and would thus embroil him, as it would certainly have done if it had been detected, in a major political scandal with every isolationist and non-interventionist in the country after his scalp. At the same time he realized that the time must come sooner or later when the continued existence of the F.B.I. would depend not only on its success as a law-enforcement agency but on its record in the extended field of counter-espionage and security intelligence. It was in his necessary preparations to meet this public challenge that Hoover needed information and assistance of the kind that Stephenson with his unique resources was able to supply.

5

About the time Stephenson first met Hoover, the F.B.I. was entrusted by President Roosevelt with responsibility for collecting secret intelligence of subversive activities throughout the Western Hemisphere likely to endanger United States security, and for the preparation of adequate preventive measures against potential spies and saboteurs. It was a responsibility which Hoover welcomed, since it represented a considerable addition to the prestige and influence of the F.B.I., whose interests its ambitious Director was always most zealous in promoting. But he was severely handicapped in discharging this new responsibility by the Neutrality Act.

Unlike the British S.I.S., the American F.B.I. was obliged to operate in the fierce glare of the public scrutiny. To enable it to function as a secret intelligence organization Hoover needed the support of Congress, but this support was not forthcoming. Hoover had no legal right to employ any agents outside United States territory. As a result, he was forced to act surreptitiously without the knowledge of the State Department and the official United States missions in Latin-American countries. His legal authority was limited to counter-espionage in the United States, and even in this he was debarred from access to sources of information which were vital to his work. For example, there was no domestic censorship of mails or cables then in existence, and so F.B.I. agents were reduced to purloining letters from Post Offices. Had this illicit action been exposed, and proved unjustified in any particular instance, it would have caused political repercussions of sufficient magnitude to place in jeopardy the continued existence of the organization or at least of Hoover as its Director. Another handicap was reflected by a recent decision of the U.S. Supreme Court declaring inadmissible in legal proceedings evidence obtained through the unauthorized interception of telephone conversations or ‘wire-tapping' by F.B.I. agents, regardless of whether the intercepted conversations endangered the national security. Thus Hoover was caught between his anxiety to carry out the President's directive in the light of the urgent need for American military preparedness on the one hand, and the almost fanatical insistence by a large proportion of the legislature in preserving American neutrality on the other.

Stephenson helped Hoover to escape from this dilemma by throwing open to him and his staff all the manifold resources of British secret intelligence, which had been developed under the impetus of war. He arranged for two of the Bureau's senior officers to visit London headquarters, where they received a detailed briefing in Nazi espionage methods, and subsequently for one of Hoover's Assistant Directors to visit the various British S.I.S. centres in Latin America and discuss with the officers-in-charge the creation of an F.B.I. field organization in that area. Through Stephenson's intimate relations with the British Imperial Censorship authorities, it was possible for an experienced F.B.I. agent to be sent to the Bermuda station and instructed in the techniques of mail examination. F.B.I. laboratory technicians were also made acquainted by one of the Bermuda experts, a woman who had joined Stephenson's New York staff, with the various methods of secretly examining letters in such a manner that their recipients were not aware that they had been opened. This highly secret process included the unsealing and resealing of diplomatic and other privileged mail so that the seals appeared absolutely intact and were impervious to the ultra-violet ray and other chemical tests.

Recruitment of staff by the F.B.I. for this confidential and delicate work led to an amusing incident. British experience had shown that the work which demanded a high degree of manual dexterity was best undertaken by women. Numbers of potential female recruits were interviewed by an Assistant Director at the Washington Headquarters of the Bureau, but the details of the work obviously could not be explained to them at this stage in case they should be found unsuitable. Stephenson's Bermuda expert had

given the Assistant Director a rough-and-ready rule, which was that a girl with neat ankles would be most likely to possess the required degree of manual dexterity for the job. The only thing that those interviewed were told was that the work involved was of a confidential character, and that they might be called upon to perform it in South America. Consequently several of them were considerably surprised when they found that the preliminary 'screening' consisted of a minute inspection of their ankles by an elderly G-man, and they began to speculate with some uneasiness as to the precise nature of the services expected of them in such places as Buenos Aires or Rio. Those who seemed particularly worried had their minds set at rest by being assured that it was not that kind of job!

Although Stephenson gave Hoover all the intelligence from secret sources that he was able to obtain at this period, not all of it was of direct interest to the F.B.I. Some of it concerned the intelligence branches of the Navy and War Departments, that is the Office of Naval Intelligence (O.N.I.) and the Military Intelligence Division (G.2). Hoover in turn passed on this particular information to O.N.I, and G.2, since Stephenson had no liaison with these service branches which at this time were opposed to the idea of collaborating with the British. In any event. Hoover was glad to do this, as it increased the Bureau's prestige and influence and gave its Director a commanding position in the existing framework of American intelligence. Hoover was also encouraged on occasion to invoke the help of the service departments on behalf of the British even when it ran counter to the State Department's strict policy of neutrality. The following incident, which took place in the autumn of 1940, provided a good example of such intervention.

Stephenson's representative in Mexico City reported that he had reason to believe that four German and twelve Italian ships, which were then lying in the Gulf ports of Tampico and Vera Cruz, were planning to run the British blockade. It certainly looked as if the Axis vessels might succeed in their intention, since the Royal Navy could not patrol Mexican territorial waters. Stephenson passed this information to Hoover for onward transmission to O.N.L At the same time he informed his London headquarters, who authorized the taking of any action he might consider appropriate in the circumstances provided the British Embassy in Washington was told what was happening. Stephenson now sent his representative in Mexico a quantity of ‘limpet' bombs small explosive charges to be affixed to a magnetized frame which would adhere to the steel plates of a ship's hull. However, while these provided a possible means of causing sufficient damage to delay the vessels’ departure, it was only a temporary measure, and it was clear that no really effective steps could be taken without the assistance of the U.S. Navy Department. Accordingly, after discussing the matter with Lord Lothian, Stephenson went to Hoover and, having explained the position to him, begged him to arrange for the despatch of a naval patrol to the area of the Gulf ports. Hoover agreed, since besides helping his British friends he considered it an excellent pretext for securing some return from O.N.L for the information he had been supplying from British sources. After meeting with considerable difficulty, he eventually won round the State Department which agreed to the plan on the strict understanding that no act should be committed which might conceivably be construed as a breach of American neutrality. Four destroyers were accordingly despatched to the Gulf with

orders to lie off Tampico and report by radio *en clair* that is, not using code or cipher any movements which the Axis ships might make.

On the night of November 15, 1940, the four German vessels steamed out of port into the Gulf of Mexico. The American destroyers approached and trained the full battery of their searchlights upon them. This was not in itself a belligerent act, but it had the effect of making the German captains think that it was the prelude to an all-out attack. Panic ensued, in the course of which one of the German ships, the *Phrygia*, either caught fire accidentally or was deliberately scuttled. Anyhow her crew took to the boats and she was abandoned as a total wreck. The others turned tail and promptly put on full speed and steamed back to port. Intelligence reports subsequently revealed that the German captains believed that they had encountered some of the old destroyers which had recently been transferred to Britain; they had informed acquaintances in Tampico next day that they 'had been ordered to surrender by British warships'.

A fortnight later, two of the three remaining German ships sailed out to sea in broad daylight. The American destroyers shadowed them and, by transmitting position signals, enabled vessels of the Royal Navy to intercept them before they had got very far and to take them as prize. The one German and twelve Italian ships which had stayed behind were apparently too intimidated to make any further attempt to run the blockade. They remained impotent in port until they were eventually taken over by the Mexican Government in April, 1941.

This incident, which did not even indirectly concern enemy subversive activities, showed that Hoover was willing to carry his assistance well beyond what he might justifiably have regarded as the limits of his common interest with Stephenson at this time. Indeed it may fairly be said that he was in the war from the moment that they began their collaboration. He also undertook to 'plant 3 what was known in technical language as 'strategic deception material' in the German Embassy in Washington. One example of this, designed to deter Hitler from embarking upon any large-scale military campaign, read: 'From highly reliable source it is learned U.S.S.R. intend further military aggression instant Germany is embroiled in major operations.' A similar piece of information calculated to mislead the Germans was to the effect that in the event of their using poison gas Britain would retaliate by using their 'secret weapon’. This was said to consist of 'some kind of glass balls containing chemicals producing such terrific heat that they cannot be extinguished by any known means'.

Finally, as we have seen, Hoover suggested the cover name which was adopted by Stephenson's organization, when, to comply with American law, it was registered with the State Department as an official foreign agency in January, 1941.

Its overt purpose was expressed as follows:

> Consequent upon the large-scale and vital interests of the British Government in connection with the purchase and shipment of munitions and war material from the United States, coupled with the presence in this country of a number of British official missions, a

> variety of security problems has been created, and these, affecting closely as they do the interests of the British Government, call for very close and friendly collaboration between the authorities of the two countries.
>
> Thus, for example, the presence in large numbers of British and Allied ships engaged in loading explosives and other war materials, and the existence of large quantities of similar materials in plants, on railways and in dock areas throughout the country, presenting as they do a tempting target to saboteurs and enemy agents, constitute in themselves a security problem of considerable magnitude.
>
> With a view to co-ordinating the liaison between the various British missions and the United States authorities in all security matters arising from the present abnormal circumstances, an organization bearing the title British Security Co-ordination has been formed under the control of a Director of Security Co-ordination, assisted by a headquarters staff.

Such, in broad terms, was the nature and scope of the assistance which Edgar Hoover was persuaded to render William Stephenson and the British war effort at this period. But it should be remembered that this assistance, whilst willingly given, was always conditioned by Hoover's great ambition for the Bureau which he directed. Unhappily this was to lead him, after his country entered the war, into the untenable position of insisting in effect upon retaining for the F.B.I., among United States Intelligence agencies,

monopoly of liaison with B.S.C. It was an untenable position, which Hoover was with some reluctance eventually brought to realize, because the F.B.I, was not recognized as a co-ordinating centre of American war-time intelligence and in its sphere of operations it was limited to the Western Hemisphere.

Analysis

An Estimate of Covid-19 Mortality in the PRC,

(Fall 2019 to Spring 2021)

by Patrick Bruskiewich

Director, Vancouver Institute of Advanced Studies

Official mortality figures released by the Government of the Canada fully reflect the realities of the Covid-19 pandemic in Canada. Official mortality figures released by the Government of the PRC do not fully reflect the realities of the Covid-19 pandemic in China. A decision appears to have been made by the PRC to redistribute mortality among different death causes, without direct attribution to Covid-19. It is a given that most victims of Covid-19 worldwide have been elderly people who had two or more health related issues. In this paper published death-rates will be used to estimate mortality in the PRC due to Covid-19 from the Fall of 2019 to the Spring of 2021. To validate this approach data from Canada will be used to allow a comparison to real data.

Using Death-rates to Estimate COVID- 19 Mortality in Canada

For Canada, mortality numbers attributed to Covid-19 is freely available through the Government of Canada and several international organizations.

To validate the algorithm that will be used to estimate mortality due to Covid-19 in the PRC, an assessment will be made for Canada and a comparison done with actual data.

From the website macrotrends.net death-rate data for Canada (per thousand citizens) is collected:

Canada - Historical Death Rate Data		
Year	Death Rate	Growth Rate
2021	7.849	0.590%
2020	7.803	0.580%
2019	7.758	0.600%
2018	7.712	1.070%
2017	7.630	1.090%
2016	7.548	1.110%

Table 1: Death Rate for Canada, 2016 - 2021

An average for the period 2016 to 2018 is 7.63 deaths per 1,000 citizens. An average for the period 2020 to 2021 is 7.83 deaths per 1,000 citizens

Using the difference of death-rates over the two periods we find a surplus rate of 0.20 deaths per 1,000. Canada has a population of 37.6 million from which we get an estimate of mortality due to Covid-19 per year as

$$\frac{0.20}{1{,}000}\, x 37.6\ x\ 10^{6}\ \cong\ 7{,}500\ deaths\ per\ year.$$

Over a two year period this would be approximately 15,000 deaths due to Covid-19. This would be a lower estimate.

Now consider the data for 2021 compared to an average over the period 2016-2018. This yields a surplus death-rate of 0.22 from which we get

$$\frac{0.22}{1{,}000}\, x37.6\; x\; 10^6 \;\cong\; 8{,}300\; deaths\; per\; year.$$

Over a two year period this would be approximately 16,600 deaths due to Covid-19. This would be a mid- estimate.

Based on this model between 20 to 22 people a day would be dying in Canada due to Covid-19. In actual fact the number is closer to 55 people a day. To date about 25,000 Canadians have died due to Covid-19 and it is expected that some 40,000 will have succumb to the disease in the first two years here in Canada. This would provide for an overall death rate of 0.53.

Why the discrepancy … death-rates due to other causes have declined in the period 2019-2021 in Canada as Stay at Home periods have been implemented and social distancing has been in force.

Mortality to other causes have been in decline in 2019 to 2021. For instance, in an average year deaths due to influenza would amount to 3,500 cases. The death-rate due to influenza is half the norm at the moment, which would represent 0.05 of the normal death-rate. Death-rates due to work place

related accidents, car accidents and the like have also declined in the period 2019-2021.

While the actual death-rate due to Covid-19 in Canada of 55 people per day is higher than that provided our estimate of 22 people per day, our model provides a *lower bound* to an estimation of mortality based on published death-rates.

Using Death-rates to Estimate COVID- 19 Mortality in China

For the PRC, mortality numbers attributed to Covid-19 is not freely available through the Government of China nor is it available through several international organizations such as the WHO. Let us try to estimate Covied-19 mortality in the PRC based on published data.

China - Historical Death Rate Data		
Year	Death Rate	Growth Rate
2021	7.542	1.890%
2020	7.402	1.940%
2019	7.261	1.970%
2018	7.121	0.340%
2017	7.097	0.330%
2016	7.074	0.340%

Table 2: Death Rate for PRC, 2016 - 2021

An average for the period 2016 to 2018 is 7.10 deaths per 1,000 citizens in the PRC. An average for the period 2020 to 2021 is 7.40 deaths per 1,000 citizens

Using the difference of death-rates over the two periods we find a surplus rate of 0.40 deaths per 1,000. The PRC has a population of 1.4 billion from which we get an estimate of mortality due to Covid-19 per year as

$$\frac{0.40}{1{,}000}\, x 1.4 x\, 10^{9} \;\cong\; 560{,}000\, deaths\ per\ year.$$

Over a two year period this would be approximately 1,1200,000 deaths due to Covid-19. This would be a lower estimate.

Now consider the data for 2021 compared to an average over the period 2016-2018. This yields a surplus death-rate of 0.44 from which we get

$$\frac{0.442}{1{,}000}\; x\ 1.4 x\, 10^{9} \;\cong\; 620{,}000\, deaths\ per\ year.$$

Over a two year period this would be approximately 1,240,000 deaths due to Covid-19. This would be a mid- estimate.

You will note the growth in the death-rate due to the fact the central government of the PRC has not enacted Stay at Home periods and social distancing has not been in force.

For want of any other measure, perhaps we can use the measure here in Canada of 0.53 per 1,000 as a Covid-19 mortality rate in the PRC, from which we get perhaps an upper estimate of

$$\frac{0.53}{1{,}000}\ x\ 1.4x\ 10^{9}\ \cong\ 740{,}000\ deaths\ per\ year.$$

Over a two year period this would be approximately 1,500,000 deaths due to Covid-19. This might be considered to be an upper- bound, since the PRC is a more rural country than Canada is.

Conclusion

Based on the surplus death-rate model outlined in this paper it is estimated that the number of citizens of the PRC who have died in the first year of Covid-19 in the PRC at anywhere between 560,000 to 740,000 people.

This estimate amounts to perhaps 1,780 deaths a day. Over two years this amounts to perhaps 1,300,000 mortalities due to Covid-19 in the PRC.

Vancouver, 16 May, 2021. This document is freely available for distribution and use provided proper acknowledgements are made of its source.

Tradecraft

Janine de Greef, dies at 95

Belgian who helped smuggle 320 downed Allied airmen to safety,

by Phil Davison

Janine de Greef in Lourdes, France, in 1945. (Family photo)

Janine de Greef was a 14-year Belgian schoolgirl when the Nazis invaded her country in May 1940. With her youth proving an effective cover, she became at 16 a member of the Belgian resistance, helping smuggle hundreds of downed Allied airmen, mostly British but including 108 Americans, south through Nazi-occupied France to neutral Spain.

The de Greef family — her father, mother and elder brother — were credited with saving more than 320 of the 800 or so Allied airmen who survived being shot down over Belgium.

At every step, Ms. de Greef was in danger of capture, even execution by the Gestapo, a fate which befell many of her Belgian comrades, some 250 of whom died in Nazi concentration camps.

During her trips through France toward the Pyrenees mountains and Spain, she was often aided by local guerrillas of the French resistance. She was believed to be among the last surviving members of the “Comet Line,” the clandestine Belgian resistance network founded in 1941 by 24-year-old Belgian nurse Andrée “Dédée” de Jongh, to spirit allied airmen through Nazi lines to safety in Spain and eventually to Britain.

Janine de Greef receives the U.S. Medal of Freedom. (Family photo)

By the time she was 19, she had made more than 30 dangerous trips by train, tram, bicycle or on foot, from France to the Spanish border, with Allied airmen "under her wing." She often pretended to be their daughter or little sister.

Before they embarked on their life-or-death voyages, she would teach the airmen, all carrying false passports her father and brother had forged, basic answers in French or German if questioned. She told American airmen never to juggle change in their pockets, which Europeans rarely do, never to chew gum and always to avoid a swaggering walk and instead comport themselves like someone whose country has been militarily occupied.

As a teenager, Janine de Greef helped downed Allied airmen escape Nazi-occupied France during World War II. (Family photo)

Once she had escorted small groups of airmen to the last “safe house” in France, below the foothills of the Pyrenees that straddle the French-Spanish border, she often walked or cycled with them to meet Basque mountain guides who would take them on a grueling several-day walk over the mountains, evading first the occupying Nazis in France and later Spain’s paramilitary police.

Although Spain’s dictator at the time, Gen. Francisco Franco, had shrewdly declared himself neutral in the war for his self-preservation, he was an extreme right-winger who strongly admired Hitler. Many Allied servicemen, French resistance leaders or French leftists got thrown into prison camps if caught entering Spain.

Those airmen who were guided safely over the Pyrenees by Basque guides, who knew the terrain because they had long been engaged in contraband, were then picked up by agents of what was then Britain’s MI9 wartime intelligence service, set up specifically to rescue the airmen. The agents then gave the servicemen diplomatic shelter in the British embassy in Madrid before taking them south to Gibraltar, a British colony, for flights back to Britain and, for Americans, on to the United States.

One of the British airmen Ms. de Greef saved was Sgt. Bob Frost, a rear-gunner whose Wellington bomber was shot down by antiaircraft fire in 1942 while on a raid aimed at the German industrial city of Essen.

Frost and his crew bailed out by parachute, and he landed in a field at Kapellen, Belgium, where a local farmer sheltered him and got a message to the local resistance to help him. An agent of the Comet Line smuggled him to Paris where, to his shock, he was passed on to Ms. de Greef.

She already had false papers for him, told him to keep quiet, just smile and let her do the talking if they were approached by Germans. She linked up with three other airmen and they set off by train from Paris to Saint-Jean-de-Luz in the Basque country of southwestern France.

Frost later made it across the Pyrenees, on to Gibraltar, and finally back to his squadron in England.

Janine Lambertine Marie Angele de Greef was born in Brussels on Sept. 25, 1925, to Fernand de Greef, a multilingual businessman, and his wife, the former Elvire Berlémont, a journalist with the newspaper L'Indépendance Belge.

When Hitler's forces rolled into Belgium, Janine, her elder brother Frederick (Freddie), her parents and grandmother fled in a convoy with friends and neighbors and settled in Anglet, a town on the Atlantic Ocean in the extreme southwestern point of France. It was also a largely French-Basque town and

on the northern edge of the Pyrenees, both of which facts would prove crucial to the family over the next few years.

The family had initially planned to sail from the south of France to the United States but, once in Anglet, they opted to stay and resist the Nazis.

Janine’s mother, known within the network only as Tante Go (Auntie Go), established a chain of “safe houses” around Anglet where Allied airmen could be hidden until agents of the Comet Line could hook them up with Basque mountain guides to make the long, rugged walk over the Pyrenees into Spain.

Albert Johnson, an English civilian who had worked with the de Greef family before the war, stayed with them in Anglet and became a key member of the Comet Line, known in French as le Réseau Comète and in the de Greefs’ native Dutch and Flemish as De Komeetlijn.

When the Comet Line was being increasingly “burnt” — identified by the Gestapo — in 1944, Janine’s parents got her and Freddie to England via Gibraltar while the parents themselves stayed on and survived, thanks to the Allied landings at Normandy that June and the gradual German retreat. When the war was over, Janine and Freddie returned to Brussels to be reunited with their parents.

Ms. de Greef received the British King's Medal for Courage in the Cause of Freedom, an award to non-British nationals, the U.S. Medal of Freedom as well as Belgian and French awards for her resistance work.

Her citation for the King's Medal read:

> "In all her work for the Allied cause, Mademoiselle Janine de Greef proved herself to be a most courageous, loyal and patriotic helper."

She never married and had no immediate surviving family; Freddie died in 1969.

After the war, Ms. de Greef worked for the British embassy in Brussels and was often invited to Britain for resistance commemoration events.

As the British airman Frost recounted in 2015 to the International Bomber Command Digital Archive in Lincoln, England, an American escaping with him once offered his train seat to a young French woman standing in the corridor.

Realizing he had spoken English, a dangerous giveaway, all the escapers froze in silence for a few seconds. But Ms. de Greef created a distraction and defused the situation. "She didn't bat an eyelid," Frost said. "A real heroine, that girl."

Ms. de Greef, 95, died Nov. 7 at the Brussels care home where she had spent the last decade. The French-based Les Amis du Réseau Comète (Friends of

the Comet Network, or Line) announced the death but did not provide a cause.

{First published in the Washington Post, Dec. 2020}

Belgian was leading figure in wartime Comet escape line used by hundreds

JANINE DE GREEF 1925-2020

National Post (Latest Edition)

1 Dec 2020

Janine de Greef, who has died aged 95, was one of the few surviving heroines of the Comete escape line that helped more than 300 shotdown Allied airmen to evade capture by the Germans and escape across the Pyrenees into Spain.

Janine De Greef was born in Brussels on Sept, 25, 1925, and educated in the city. Her father, Fernand, was a linguist and businessman and her mother Elvire worked for the newspaper L'independance Belge.

When the Germans invaded the Low Countries on May 10 1940, 14- year-old Janine escaped with her parents, her grandmother and her older brother Freddie in a convoy of cars, with other newspaper staff who hoped to continue publishing it in a free zone.

The family's plan was to sail from the south of France to the U. S., but instead they ended up in Biarritz renting a house, "Villa Voisin," in the countryside outside the small town of Anglet. Albert Johnson, an English friend of the De Greefs who had travelled in the convoy from Brussels, declined his ticket to England and stayed with the family throughout the war.

In due course he became an important member of “le Réseau Comète,” the Comet Line, in the south west of France.

The Belgian- run escape line had become established in the late summer of 1941 and the De Greef family became the key elements of its southern sector. In October 1941, the first of more than 300 evaders passed through the De Greef house, with arrangements made by Janine’s parents (codenamed Tante Go and Oncle Dick) to smuggle them across the Pyrenees into Spain, where British agents of MI9 received them.

The organization of that crucial southern end of the line became a family affair. The local authority employed Janine’s father as a translator with the German occupiers, and he was responsible for billeting soldiers and evacuees in the area. This enabled him to obtain documentation for the evaders. He was also the official passport photographer. Freddie, her brother, was an excellent artist who forged the official stamps and often acted as a guide.

Janine’s mother, Tante Go, set up, with others, a network of “safe houses” in the region and arranged Basque mountain guides, among them some smugglers. Her contacts with smugglers led to her discovering the involvement of some German officers in the illicit business, which gave her useful blackmailing power over them.

As a young and pretty girl with an air of innocence, Janine could escort groups of evaders without raising suspicion, accompanying them on train

journeys from Paris to Anglet via Bayonne. Bob Frost, a rear gunner in Wellington bombers, told of one occasion in 1942 when she was the sole escort in a train compartment full of evaders, when an American stood up and, unthinkingly speaking English, offered his seat to a lady in the corridor. Janine handled the risky situation with skill and maturity, and the incident passed without trouble.

Her main work was in the region between Villa Voisin and the dangerous border zone. On some 30 occasions she took evaders from Bayonne to the "Last House", a safe house close to the Spanish border, using a local train before walking or cycling the final miles. She also made longer trips to the border to deliver evaders to a rendezvous with the Basque guides. The use of so many bicycles for the final phase caused a large buildup after the evaders had left for the mountains, and disposing of them became a problem.

After a number of significant betrayals, leading to executions, by which time 106 evaders had crossed the Pyrenees, the Comet Line was in danger of collapsing. But by the combined efforts of the De Greef family and Albert Johnson, it was able to recover and continue until the Allied landings in 1944, when a further 200 airmen had successfully crossed into Spain.

At this time, the key members of the network were at risk of being arrested by the Germans, so MI9 instructed the De Greefs and others to escape to Spain.

Tante Go refused to leave her mother, however, so remained in France.

Janine De Greef crossed the mountains with three other young female helpers and her brother, and they then travelled to Madrid before being flown to England. Once the whole of France had been liberated, she returned, initially to Biarritz.

After the war, she again took up residence in the family apartment in Brussels, and worked for the British embassy as a commercial attaché.

Tante Go was awarded the George Medal, but always insisted that it was an honour for the whole De Greef family. Janine was awarded the King's Medal for Courage in the Cause of Freedom, the U. S. Medal of Freedom, and Belgian and French awards for gallantry.

Janine De Greef was unmarried.

Col. Oleg Penkovskiy Unmasked Three Soviet Spies in West

by Don Cook LA Times

Nov. 17, 1965

Paris – Whatever the value of the spy papers by Col. Oleg Penkovskiy, or even their validity, which is being questioned by experts on Soviet affairs, his greatest service to the West was the unmasking of three key Russian agents in Paris, London and Stockholm.

The three most important espionage cases in the West in the last five years were all broken by counterintelligence services on the basis of information passed to the British and the United States by Penkovskiy.

The cases involved:

Georges Paques a senior French civil servant who spied for the Russians in Ministry of National Defense and .later in NATO headquarters in Paris. He was caught and sentenced to life imprisonment in July of I964.

Col. Stig Wennerstrom of the Swedish Army who spied for the Russians in the Swedish Ministry of Defence and also while serving as Swedish Military Attaché in Washington. He was caught and sentenced to life imprisonment in July, 1963, at about the same time when Penkovskiy went on trial in Moscow with his British contact, Greville Wynne.

William J. C. Vassall. A senior clerk in the British Admiralty, who had been recruited by the Russians through homosexual blackmail during a tour of duty in Moscow. He was apprehended and sentenced to eighteen years in prison in September, 1962.

Penkovskiy did not finger these Russian agents directly. But he did pass to the British and American intelligence services information that enabled them to trap the three spies.

A Penkovskiy specialty was sending the identity numbers on Western documents .that were reaching the Russians. The identity numbers were sufficient to start the counter-intelligence search for the spies in the West who were passing the documents to Soviet intelligence.

In the case if the British Admiralty documents and the Swedish Defense Ministry documents, the work of isolating Vassall and Wennerstrom went fairly rapidly- But the apprehension of Georges Paques was more complicated and took more time.

Partly this .was because many hundreds of documents had to be sifted and, checked. Partly it was because the French counterintelligence services, which are highly effective, do not as a rule respond very swiftly to information provided from American or British sources.

In the end the break in the Paques case came as a result of the assiduous espionage the Frenchman had done. Paques served from 1958 to 1962 in the

private office of French Defense Minister Pierre Messmer. He later became chief press officer at NATO with a “cosmic top secret” clearance, NATO’s highest security classification.

Among the document identity numbers Penkovskiy sent to the West was one with a very unusual and limited classification. It was a French NATO standing group document—in other words, a French position paper prepared for the NATO military standing group in Washington.

When the French checked on the document, they discovered that it was the draft of a French position that eventually was altered and re-numbered before it was actually submitted to the standing group.

The document, therefore, had received very limited circulation. It had been prepared in Washington by the French element on the standing group and sent to Paris for clearance at the Ministry of Defense. Only six persons signed for it at the Ministry when it was discussed, altered and sent back to Washington. One of these was Georges Paques.

Had Paques limited his activities to general Ministry of Defense documents or NATO documents, with much wider circulation, it might have taken months to narrow the search. But in the brief period of approximately thirty – six hours in which that particular French standing group document was in Paris for clearance, he took it home, photographed it and returned it to its proper place next day.

When the French identified the document on the basis of the number transmitted from Moscow to the British and Americans by Penkovskiy, they immediately put a 24 hour tail on each of the six who had signed for it—including the Minister of Defense. In about ten days, Paques was seen in contact with a member of the Soviet Embassy staff in Paris whom the French knew to be a KGB agent.

His arrest followed swiftly, and he confessed promptly. At his trial, he testified in words reminiscent of some of the *Penkovskiy Papers* that he spied for Russia because he felt that it would help preserve peace if the Russians were fully informed of NATO plans.

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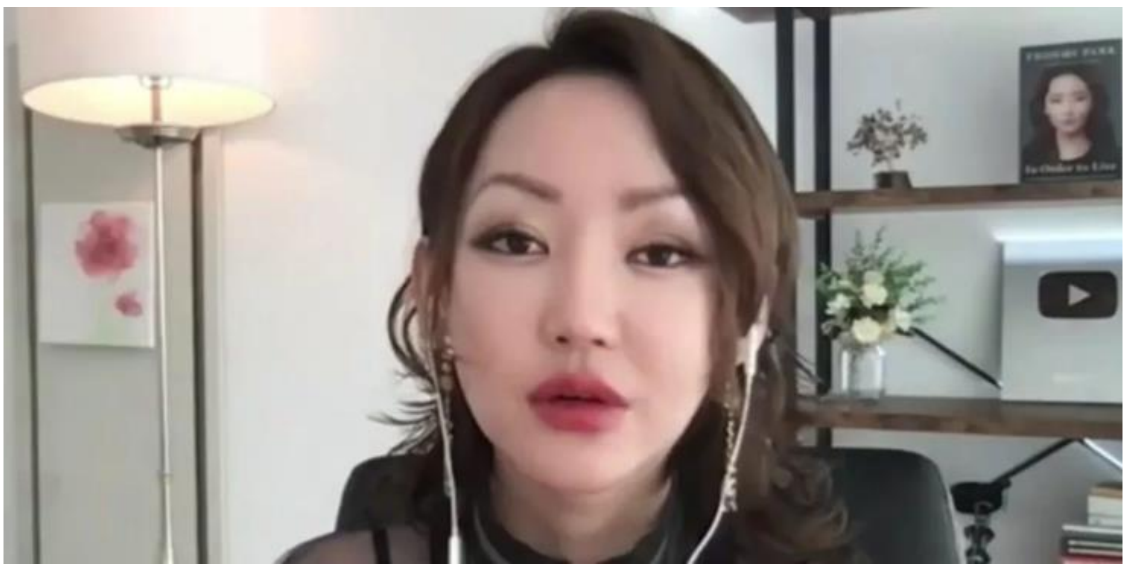
Political Correctness at Columbia University like North Korea

A North Korean defector says going to Columbia University reminded her of the oppressive regime, saying she felt forced to 'think the way they want you to think'

15 June, 2021 (On the Internet)



Yeonmi Park, a North Korean defector, in a recent interview with Fox News

A North Korean defector has told Fox News that she fears for the future of the US after attending Columbia University, where she said the atmosphere reminded her of her days under the oppressive Kim regime.

Yeonmi Park, 27, has spoken frequently about her harrowing escape from North Korea at the age of 13 with her mother. She is now a US citizen.

In 2016, Park transferred from a South Korean university to Columbia University in New York, and told Fox News in an interview on Monday that the transition was jarring.

She described a culture of political correctness at the Ivy League institution that she said rivaled the thought-policing that happened in her native country.

"I expected that I was paying this fortune, all this time and energy, to learn how to think. But they are forcing you to think the way they want you to think," Park told Fox News. "I realized, 'Wow, this is insane.' I thought America was different, but I saw so many similarities to what I saw in North Korea that I started worrying."

In one example, Park said she was scolded by a staff member for expressing a like for Jane Austen's novels.

"I said, 'I love those books.' I thought it was a good thing," Park said.

"Then she said, 'Did you know those writers had a colonial mindset? They were racists and bigots and are subconsciously brainwashing you.'"

Columbia University did not immediately respond to Insider's request for comment on this story.

Park said she also found it bizarre that professors asked students what their preferred pronouns were, and complained about using gender-neutral pronouns.

"English is my third language. I learned it as an adult. I sometimes still say 'he' or 'she' by mistake, and now they are going to ask me to call them 'they'?" she said. "How the heck do I incorporate that into my sentences?"

"It was chaos. It felt like the regression in civilization," Park said.

"Even North Korea is not this nuts. North Korea is pretty crazy, but not this crazy," she added.

Park said her experience at Columbia made her believe that American students were losing the ability to think critically, something she said she is all too familiar with from her time in North Korea.

"In North Korea I literally believed that my Dear Leader was starving," she said. "He's the fattest guy - how can anyone believe that? And then somebody showed me a photo and said, 'Look at him. He's the fattest guy. Other people are all thin.' And I was like, 'Oh my God, why did I not notice that he was fat?' Because I never learned how to think critically."

"That is what is happening in America," she said.

The Beauty who Romped with Wellington and Napoleon

by Dan Julius

In June of 1815 all Europe hung breathlessly on the outcome of the Battle of Waterloo. There were no fence-sitters on the continent; each man and woman's lot was cast with either Napoleon or Wellington, for French greatness and European unity, or for national self-determination and an end to military conquest. No one could afford to stay aloof from the battle, for its resolution would bring rewards, or suffering to all, depending on which side they had taken.

With one exception!

The exception was a beautiful, slender, dark haired, full-bosomed lady who, at the very moment that the battle was joined, was stretching cat-like under an ornate boudoir canopy in a Paris mansion, debating with herself whether to ring for breakfast, or to bathe first. Her appetite won out, and when her breakfast tray was brought, there was a bulletin alongside the plate of brioches, informing her that Napoleon and Wellington were met in mortal combat. She smiled to herself — surely the only one in all Paris to greet the news with a smile—and trilled a scale ending with a true, pure and sweet note worthy of a mockingbird.

There may have been more than a hint of mockery in the note. Europe may have agreed that the battle was being waged for a determination of military,

political and economic supremacy, but to the beauty sipping her coffee, it was merely a way of determining which of two famous heads would lie beside hers on the lacy pillow of her bed. To her, Napoleon and Wellington were simply two naughty boys fighting over candy that had been tasted and then taken away by circumstance. And she was the candy.

Her name was Giuseppina Grassini. She was the prima soprano of the famous La Scala Opera in Milan. For the past few years she had been commuting between La Scala and the Paris Opera House, where critics had acclaimed her as "the finest soprano heard in France since before the Revolution." The Parisian public adored her. And when it became common gossip that she had been the mistress of both the Emperor Napoleon and his arch-enemy, the Duke of Wellington, the public merely winked and smiled and admired her all the more.

Such admiration was nothing new to Giuseppina. She had known it from childhood when she used to sing solos in the church choir of her native village of Castanza, Italy. It was here, when she was fourteen years old, that an official of La Scala heard her and arranged with her parents to have her come to Milan for further training under the auspices of the opera company. Four years later she made her debut and La Scala had a new star.

That star was shining even more brightly in 1797 when Giuseppina first met Napoleon Bonaparte. She was just 24 years old when the "Liberator" of Italy arrived in Milan for a breather between military campaigns. It was a well-

earned breather, for Rome had just ceded the provinces of Bologna, Ferrara and Romagna to his rule. The city of Milan greeted him as a popular hero.

And what great tribute could the city fathers pay him than to arrange to have Mme. Grassini serenade him at the castle of Montebello he had taken over as his quarters? When the concert was over Napoleon signaled his staff to leave him alone with the beautiful young singer. Only his adjutant, M. Berthier, remained to record an account of the interview in his diary.

“The General complimented Mlle. Grassini on her singing,” wrote Berthier, “and then poured some champagne for himself and her. He landed her the glass and a few drops spilled into the cleft of the rather low-cut bodice she was wearing. With an apology for his clumsiness, he dabbed at the liquid with a lace handkerchief, expressing concern over the possibility that her dress might be stained beyond repair. Mlle. Grassini assured him that it was a matter of no consequence and then reassured him of this by grasping his hand betweens hers and pressing it to the uncovered portion of her bosom. Napoleon looked at her for a long moment and then, without moving either his eyes or his hand, he said: ‘You may leave us now, Berthier.’ I obeyed and went straight to my quarters and to sleep. Towards dawn I was awakened by a servant with a message from Napoleon bidding me see Mlle. Grassini to her home. We traveled in a closed carriage and made casual conversation, but I could not help but notice that she wore a different frock from the one which had been stained.”

The “different frock,” undoubtedly, came from the wardrobe which Napoleon carried with him for use by the two mistresses who had accompanied him throughout the Italian campaign. A French girl and a Spanish girl, both had been sharing his bed regularly, and, from documented reports, often at the same time. Also during this period he was carrying on a love affair by mail with his bride, Josephine Beauharnais, the infamous French courtesan whose marriage to him the year before had almost wrecked his career before it started. Three amorous involvements might have seemed enough for an ordinary man, but history tells us that Napoleon was no ordinary man.

He was as aggressive in his sex life as in his military campaigns. Involvements didn’t frighten him. He remained involved for as long as he pleased and then became disengaged with determined finality whenever he chose. And that’s how his initial affair with Giuseppina went.

His aides report her presence in the castle and in his boudoir on many occasions following that first one. Then, abruptly, she was seen no more on the premises. At the same time, his French mistress and his Spanish mistress were sent packing to their respective homes. Behind these events lay the imminent arrival of Josephine herself at Montebello.

It was after she got there that Napoleon made certain arrangements involving his former operatic bedmate which might be construed as adding insult to injury. Writing of this interlude with Josephine, his biographer Emil Ludwig describes it this way: “Occasionally he steals time for a brief love festival.

They drive across to Lake Maggiore; and when among the rhododendron bushes beneath the baroque stone edifices on Isola Bella, Grassini, the heroine of La Scala, uplifts her thrilling voice and sings an appassionata by Monteverde, Napoleon sits
wrapped in thought, his companion's hand clasped in his own."

What Giuseppina's thoughts may have been as she warbled 'mongst the rhododendrons for the entertainment of her former lover and his wife may only be guessed at. Whatever they were, they must have been even stronger as she watched them drive away, locked in a clinch which another adjutant of Napoleon described thusly: "In the carriage he would take marital liberties which were apt to be rather embarrassing to Berthier and me." And how much more embarrassing to his watching mistress!

The embarrassment of the serenades was brought to an end when Napoleon, without even bothering to bid her farewell, left Milan with Josephine. It was three years before Giuseppina saw him again and the interim changed her from a hero worshipping girl to a sophisticated and calculating woman. Their second meeting took place when Napoleon returned to Milan in 1800, after his victory at Marengo had solidified his position as Consul General of France.

He went to La Scala to hear her sing and after the performance he called on her in her dressing room. Following a preliminary conversation, he signaled an aide to bring some champagne and then leave him alone with the opera

star. What followed was described by Giuseppina in a letter to a friend with whom she had taken her training at La Scala.

“I bade the General let me pour the wine, reminding him of his carelessness upon our first meeting. “He laughed, then looked at me in his compelling way and commented that if he remembered aright, the results of that mishap had been quite
enjoyable.

“ Evidently not so enjoyable as to make your greatness tarry,’ I told him.

“My coquettery obviously amused him. ‘Alas, one of my more regrettable mistakes,’ he said.

“’It may be rectified,’ I murmured.

“‘Like this?’ He embraced me.

“I must tell you, Gina, that he is not like other men. There, in that grimy dressing room backstage at La Scala, I was surely made love to by a god from Olympus. No mere man bore me to the floor and tossed my skirts up to the heights of passion. As it had been three years past, the experience was overwhelming. I do not speak of love, mind you, only ecstasy.

“It was all I could do to regain my wits when it was over. Somehow I managed. ‘And now you will desert me again?’ I asked him.

“‘I must return to Paris,’ he answered.

‘But then why should you not come with me? ’

“And so I have, Gina. I sing now in the Paris Opera House, and Napoleon visits me frequently. I have been well-received by critics and audiences. There is talk that my lover may soon be crowned Emperor! But were he a chimney-sweep, my thighs would still grow warm and weak at the remembrance of his embraces.”

Alas, following Napoleon’s coronation four years later, Giuseppina was left almost wholly dependent upon such ‘remembrances.’ His career of conquest was fully launched, and his visits to Paris became infrequent. She went back to Milan, only returning to Paris to meet him occasionally. Meanwhile, he gave the Italian beauty much cause for bitterness – bitterness which, in fairness, was undoubtedly assuaged by the generous gifts of jewels and furs he periodically showered upon her. In the wake of his military conquests, news of one amour after another reached Giuseppina. There was the Viennese Countess who sneaked past the barricades to share his tent while he laid siege to the city. There was the Netherlands wench who shared his rooms at the coronation of his brother Louis as King of Holland and got him *in Dutch* with Josephine. There was even another Italian girl in Naples and in an interlude he spent there in 1808 he split his time between her and Giuseppina. And finally in 1810, he divorced the barren Josephine to marry

the Princess Marie Louise of Austria, and temporarily ended his liaison with Giuseppina.

But he didn't end his amorous career. Far from it. He was off for Russia, and en route he became deeply involved with a Polish Countess and, later, during the 1812 retreat, he still managed to have casual affairs with the wife of a German diplomat and the daughter of a Polish general who had defected to his cause. Europe buzzed almost as much about his amatory exploits as about his recent disastrous military ventures.

At this time, however, where amours were concerned, the French conqueror was sharing the spotlight with an enemy. The Duke of Wellington— an Irishman who'd made his career in the English army in much the same manner that Napoleon, a Corsican, had succeeded in the French army — was cutting both a romantic and military swath through Europe to rival Napoleon's.

The amatory aspects of Wellington's career had first attracted attention in 1807, when Napoleon was still commuting between Josephine and Giuseppina. In that year the Duke had led two military expeditions, one against the Danes, and one assisting Portugal in its revolt against Napoleonic rule. In Denmark he had compounded the defeat of the Danish army by a liaison with a Princess of the Royal House. At a later date, she claimed he had actually raped her, to which Wellington replied that the lady had seduced him. No matter, though, for the incident was overshadowed by an

affair with a Lisbon society lady which ended in the scandal of his killing her husband in a pistol duel.

With Napoleon busy in Russia, Wellington led Spanish forces against the French Army that occupied Spain. He won battle after battle, his military star rising as Napoleon's descended. However, in the spotlight of scandal, the two generals remained equals.

December of 1812 found a war torn Europe taking time out to gossip over the amours of both. This was the month in which Wellington drove the French Army beyond the Pyrenees and out of Spain, thereby winning the Peninsular War. It was the month in which the defeated Napoleon returned to Paris, leaving half his army behind as frozen corpses on the Steppes of Russia. It was a breathing-spell for scandal.

The newly-formed Spanish government— which but a month before had sent missives praising Wellington to the sky to Buckingham Palace —now felt compelled to notify their English allies of a "delicate situation" which had developed in the wake of the Duke's victories. The "delicate situation" was their way of referring to the hundreds of impregnated Senoritas — many of whom claimed to have been tumbled forcibly by the high-spirited soldiers of the English Army.

Following this, two messages crossed paths as they were carried between England and Spain. The first was a directive from the English government to

Wellington which instructed him to make any reparations necessary to smooth relations between the two countries.

The second was from the Royal House of Spain itself to the English Prime Minister. It denounced the Duke as a high-handed satyr who seemed bent on turning the Royal Court's ladies-in-waiting into his own personal harem and who backed up that intention with force of arms. Specifically, reference was made to a reception to which the Duke had been invited where he lured three ladies of noble birth into a private room of the palace, posted guards outside the room with orders to shoot any intruding husbands and proceeded, with the help of two aides, to force the ladies to submit to him.

Wellington's defense was that while he had perhaps been indiscreet—due, no doubt to partaking of too much Spanish wine—the ladies had submitted willingly. This explanation didn't sit to well with the Home Office, which had consistently placed obstacles in Wellington's military path and now smugly condemned him as "not a gentleman" and "not even an Englishman" to boot.

With his Irish up, Wellington returned to London to defend himself. Meanwhile, Napoleon, licking his wounds in Paris, had rediscovered Giuseppina Grassini. His second wife, the Princess Marie Louise, may have given him the heir he so desired, but when it came to assuaging the memory of the Russian chill, her Austrian royal blood ran tepid compared to the fiery Italian soprano.

The juiciest of scandals, however, has a way of running dry in the face of military necessity. And so it was with both Napoleon and Wellington. The former left Paris to lead his forces in the battles of Lutzen and Bautzen, and later in the disastrous Battle of Leipzig. Meanwhile, the English government forgave Wellington his “indiscretions,” and put him in command of an army to invade the South of France.

It was 1814 by the time the smoke of many battles had cleared and when it did, a tail-dragging Napoleon was headed in exile for Elba.

And Wellington had been appointed the English Ambassador to Paris! Late Spring, as fate would have it, the Duke followed the trilling birds to the opera house one evening.

He had heard of Mme. Grassini, knew of the scandal involving her and Napoleon, and was curious to watch her perform. But he was disappointed. In the wake of Napoleon’s exile, anti-Bonaparte sentiment had swept Paris and the management had decided not to risk letting Giuseppina sing. Even as Wellington heard the announcement of a substitution, the Italian diva’s servants were packing her things for the trip back to Milan.

The trip was never made. Wellington exerted his considerable influence on the French government he had helped create, causing Giuseppina to be reinstated as the prima soprano of the Paris opera. When she learned of his efforts in her behalf, she sent the Duke a note of thanks and invited him to tea.

The Duke, an incorrigible kiss and- tell diarist, recorded the incident as follows: “This Italian woman of Napoleon’s is as all reputation would have her be. A ripe and bosomy fruit in the flush of womanhood, if her responsibility be as rumor has it, then Bonaparte’s empire may rightly have been well lost.

“Thanking me for interceding on her behalf, she was frank about her relations with the erstwhile Emperor. Then, with lowered lids, and in the softest of Latin accents, she pronounced an innuendo having to do with the disposition of the spoils of victory. On the instant, I realized she had reference to none but herself.

“Quick to seize upon this, I bestowed a compliment and assuaged the blush with which she received it by taking her hand in mine. She recovered sufficiently to observe that I was deserving of my reputation for boldness, which remark I took as an invitation to further boldness and was so moved to kiss her.

‘Her response to this being unmistakably warm, I followed with further liberties which she gladly allowed. These, in turn, resulted in such disarray of clothing and eagerness of flesh that wordlessly did we agree to proceed to her boudoir whence we shed our garments and left fiery imprints of passion on the bed linen throughout that truly memorable afternoon. Thus have I warbled with Napoleon’s nightingale, finding her to be a lovebird to the taste

of my Irish cage. A cage, which she assures me is even more satisfying than her Corsican nest of yore."

A wordy wooer, the Duke kept a bed-by-bed account of the affair which followed. It was some six months later that he made the following entry: "My Italian songbird sings of love as irresistibly as ever. Her allure grows with every liaison—so different from the many women of many lands I have known. Ah, the delight, after a night in her arms, of waking to the sound of that magnificent voice paying homage to Eros with an aria of gratitude ..."

Could it be that the high notes of that aria were wafted by the winds to the Isle of Elba? A fanciful thought, but surely something prodded Napoleon to break his word, raise an Army and set sail for France. Knowingly, or not, his action had the effect of driving the Duke from the arms of his Latin lovely to the arms of war.

Wellington fled to England to take command of a hastily assembled force that had been recruited to stop the rampaging Emperor.

Before this could be done, however, on March 20th, 1815, Napoleon entered Paris. The quickly adaptable populace greeted him with open arms; and no less open were the quickly adaptable arms of Giuseppina Grassini.

Once again she became the Corsican's concubine. It seems quite probable that with all the hustle and bustle attending his return, nobody found the time to tell Nappy that his Italian pasta had been floating around in an Irish stew during his absence. More likely, nobody had the nerve to tell him.

In any case, Napoleon's affair with the side-switching soprano was carried on more flagrantly than ever. But he was the man of the hour and nobody questioned his off-hours pleasures. Indeed, the presence of his Milanese playmate at his side during a victory parade elicited only a tolerant Gallic wink from the populace. It was taken for granted that while his boots stamped out the occasional brush-fires of rebellion during the day, at night they were parked contentedly 'neath the Signorina's international bed.

He had to grab them in a hurry though, when, one June night word was brought to him that Wellington's Army was in Belgium, massed for an attack on France. And so, with a farewell squeeze of Giussepina's operatic bellows, Napoleon set out to meet his Waterloo.

The rest is history. The Iron Duke trounced the Corsican soundly and shipped him off to St. Helena to live out his life in exile. To show their gratitude, the English government placed Wellington in charge of the army of occupation in France, and the Duke once again returned to Paris. Giuseppina greeted him—you guessed it—with open arms.

But, as fate would have it, they closed on thin air. Wellington had heard of her interlude with Napoleon while he was busy forming an army to beat him. He admired her fine Italian hand, but he refused to let her play the cards fate had dealt her. Instead, he called for a new shuffle and when Giussepina picked up her pasteboards, she found a little French milliner, some ten years younger than she, had walked off with the Wellington pot.

Not only that, but she found the very pressure which had once been exerted in her behalf was now being brought to bear to make her leave Paris. Napoleon’s Waterloo was also her swan song and so, with a fatalistic shrug, Giuseppina Grassini returned to Milan. There she lived to the ripe old age of 77, a star of the opera to the last, singing of love and intrigue with the heartrending fervor of a soprano who’d slept on both sides of one of the world’s most historic blankets—only to find that in the end the blanket of duplicity is but a shroud!

Science and Technology

Two Elements For One - Scientific American (October, 1939)

The Most Important Scientific Discovery of the Present Year is also the Biggest Explosion in Atomic History … Splitting the Uranium Atom

The Fifth Washington Conference on Theoretical Physics was sitting in solemn conclave when the news broke. Professor Nils Bohr of Princeton and Professor Enrico Fermi of Columbia rose to open the meeting with an account of some research going on in a Berlin laboratory. Professors Bohr and Fermi are Nobel Prize winners both, and their names are as well known to scientists as Toscaninni's is to music lovers. The Conference therefore expected something extra special. They weren't disappointed.

It was January 26, 1939. A few weeks before, at the Kaiser Wilhelm Institute in Berlin, Dr. Otto Hahn, a distinguished German physicist, had obtained an utterly unexpected result from some more or less routine experiments. Following the original example of Professor Fermi, Dr. Hahn and his co-worker, F. Strassmann, had for many months been bombarding uranium with neutrons and studying the debris left by this atomic warfare.

It would not have surprised them at all to find radium as one of the products. In fact, they had done so before, or thought they had. Radium and uranium are near neighbors in the table of elements, and it is nothing new for

scientists to transform one element into another close to it in weight and electric charge.

But it was news, and big news, to discover barium among the debris — barium, which is only a little more than half as heavy as uranium. It meant that the neutron bullets had succeeded not merely in knocking a few chips off the old block, but in blowing the whole atom asunder with a terrific explosion.

The theoretical and practical import of Hahn's discovery may not be immediately obvious to the laymen. The article will attempt to interpret its significance in later paragraphs. But on the scientists, the news had the same effect as the tidings of gold in California had on the Forty-niners. They flew to their laboratories to find the treasure for themselves.

A few insiders had already jumped the gun ahead of the Conference and of the rest who learned of the discovery through the newspapers. In Copenhagen, Dr. O. R. Frisch and Professor Lise Meitner, who had previously worked with Hahn on the same problem, had verified his results ten days earlier. A group of Columbia University physicists, including Fermi, independently thought up and carried out a similar experiment by January 25, the day before the Conference. By the time the meeting wound up its affairs January 28, three more laboratories — at the Carnegie Institution of Washington, Johns Hopkins, and the University of California — joined the chorus of confirmation. In a word, Hahn was right. Uranium,

and thorium, too (thorium is also among the heaviest elements), had been split in two by neutron bombardment.

The phenomenon was quickly dubbed "nuclear fission," and in the months ensuing since its discovery, nuclear fission has grabbed the spotlight from the "heavy electron" sensation of 1937-8. Dozens of the world's top-flight physicists have been busy as bees, roaming the clover of a new field of research.

The first task of the investigators was to get a picture of what had happened. Dr. Frisch and Miss Meitner promptly supplied a pretty good one.

The nucleus of an element, they pointed out, is now thought of as an aggregation of protons and neutrons packed together into an inconceivably small space. The number of protons, or units of positive electric charge, accounts for the chemical behavior of the element. Neutrons are units of weight and have no charge. Together the neutrons and protons make up the mass of the nucleus. The simplest nucleus is the single proton belonging to the lightest element, hydrogen. Going up the atomic scale, adding one proton and a varying number of neutrons for each successive element, we arrive at last at uranium. This heaviest of elements is invariably characterized by its 92 protons; in its commonest form it contains 146 neutrons as well, giving it a total weight of 238. Two other forms, weighing 235 and 234, also occur in small quantities. These are called the three natural isotopes of uranium, and are distinguished by the shorthand symbols $^{238}U_{92}$, $^{235}U_{92}$, and $^{234}U_{92}$.

Now all the known elements heavier than mercury — that is, thallium, lead, bismuth, polonium, radon, radium, actinium, thorium, protactinium, and uranium — have isotopes that are naturally radioactive. Their nuclei are so complicated that occasionally one will spontaneously simplify itself by shooting off a particle.

We can picture the process nicely if we imagine for a moment that the radioactive nucleus is like a drop of water, composed of many molecules. One of the molecules near the surface somehow acquires a little more energy than its fellows and evaporates.

The stage is now set to return to Dr. Frisch and Miss Meitner, whom we left some paragraphs ago. Their conception of the nuclear fission process continues the analogy of the drop of water. Suppose the H_20 molecules are violently agitated by a source of energy outside the drop. Instead of evaporating gradually, the drop splits in two. Similarly, a uranium nucleus, stimulated by the impact of a neutron bullet, may divide into two smaller nuclei of roughly equal size.

These fragments are in themselves unstable, and quickly disintegrate to form still other nuclei. In fact, a whole series of transmutations generally follows the fission of uranium or thorium. Since Hahn first found barium among the products, he and other investigators have identified antimony, tellurium, iodine, xenon, cesium, and lanthanum in one group; bromine, krypton, rubidium, strontium, and yttrium in another, with many possible additions.

The explanation is simple enough. The original fragments contain too many neutrons in relation to their proton content, and must get rid of them to achieve a stable form. One of two things happens. The nucleus may simply expel a whole neutron, reducing its weight by a unit. Or one of the neutrons may be converted into a proton plus a negative electron inside the nucleus, which promptly ejects the electron. In the latter case, the nucleus remains approximately the same weight but acquires an additional positive charge, thus becoming a chemically different element. Experiments have proved that both these types of disintegration actually do take place.

No one knows yet whether the same two original products are always formed when uranium divides, or what they are. But if one of the fragments is barium, with 56 protons, the other must have 92 minus 56, or 36, protons, which would make it an isotope of the gas krypton.

If the barium tries to stabilize itself by emitting an electron, it becomes a lanthanum isotope, which may in turn convert itself into cerium by electron emission. The krypton also disintegrates in the same way, successively becoming rubidium, strontium, and perhaps yttrium and zirconium. We can show these chain reactions by a formula where the sub-scripts represent the number of protons of the products:

Ba56 -> La57 -> Ce58 -> Kr36 -> Rb37-> Sr38 -> Y39 -> Zr.40

Again, if the two original fragments are strontium and xenon instead of barium and krypton, we may have the following chain reactions:

Sr38-> Y39-> Zr40

Xe54 -> CS55 -> Ba56 -> La57 -> Ce58

In a discovery like this in the realm of pure science, it is always easier to see the theoretical importance than to find a practical application. The fission of uranium has provided a field day for the physicists who like to take atoms apart and find out what makes them tick. It adds a new chapter to their knowledge of the nucleus — the forces that hold it together, the collective behavior of its constituent parts, its reaction "under fire," its destiny.

In addition, it clears up a mystery of long standing, dealing with elements heavier than uranium. When, in 1934, Fermi began his experiments with uranium, he soon found that negative electrons were always emitted under neutron bombardment. We know now that they are usually the products of the chain reactions just described; but at that time nuclear fission was not even dreamed of. Fermi naturally concluded that the uranium nucleus captured the neutron, converted it into a proton and expelled an electron.

Here, then, was a supposedly new element with 93 protons, unknown to nature. Moreover, this new element seemed to emit another electron to form another new nucleus of 94 protons. These were called "transuranic" elements, and up until lately they were a headache to the numerous investigators who worked on them. The latter kept finding more and more transuranic; and when they studied their chemical properties they found inexplicable variations. Last November, just a few weeks before Dr. Hahn

stumbled on the real secret, he announced that he had found at least 16 different kinds of nuclei resulting from neutron bombardment of uranium. Some of them, indeed, behaved chemically like barium, lanthanum, and other light elements, but they were thought to be isotopes or isomers of heavier elements such as radium. (Isomers are nuclei having the same total weight but different chemical properties. Isotopes have the same proton content but varying total weights.)

When the announcement of nuclear fission came, it was immediately realized that the electrons were not in general emitted by the uranium nucleus itself but by its lighter fragments. The mystery of "transuranic elements" was practically solved. It does seem, however, that a neutron bullet occasionally fails to give its target quite enough energy to divide; the uranium isotope disintegrates by electron emission and really does form a new element with 93 protons. But one such problem child is far better than 16.

So much for the theoretical significance of nuclear fission, far-reaching though it is. It is pretty hard to amass as much weight on the practical side of the balance. But our imaginations are immediately seized by the terrific amount of energy liberated when a single uranium nucleus explodes. The two fragments fly apart activated by some 200,000,000 electron volts — a total far greater than that associated with any other atomic phenomenon except cosmic rays.

The tabloids love to write of blowing up the world with a gram of matter, and it’s not such a sensational idea as one might think. Even a tiny mass has an enormous potential of energy if it could but be freed. It is just such a conversion of mass into energy that speeds the fission fragments on their way.

The weight of any nucleus is never quite equal to the sum of its individual protons and neutrons. A small proportion of their mass, called the “packing fraction” or “mass defect,” is somehow transformed into the force that holds the nucleus together. Otherwise the positively charged protons would all repel each other and scatter in every direction.

The packing fraction for uranium is, because of its large number of particles, greater than that for the simpler elements into which it divides. This difference in energy is released with the two fission fragments.

OF course, 200,000,000 volts is an astounding energy compared with the size of the bodies which possess it. But for practical purposes it is absurdly small, amounting only to about three ten thousandths of an erg. In more everyday terms, it would take 25,000 billion fissions per second to produce one horsepower — figures which dwarf even the national budget. The very best a laboratory can do so far is produce a few hundreds per second.

If atom smashing could be made more efficient, power production by means of nuclear fission would not be beyond the realms of possibility. But under present conditions, the process is as inefficient as removing the sand from a

beach a grain at a time. Or, more graphically, it is like shooting with buckshot at a network of beads strung yards apart. The size of the target is comparable with the size of the projectile, the empty space between targets is enormous compared with the diameter of either, the stream of bullets cannot be well controlled or aimed, and therefore it is much more probable that the neutron projectile will fly past a uranium nucleus than to score a direct hit and be captured. In fact the chances are thousands to one against fission taking place.

Neutrons have proved themselves more efficient atom-busters, however, than other projectiles like protons or alpha particles, which are positively charged and hence repelled by the positive nuclei. To get a stream of neutrons, a preliminary bombardment must take place. One common method employs the radioactive gas radon, which spontaneously emits alpha particles (helium nuclei with double charge and mass four). The alpha particles are allowed to fall on a sheet of beryllium, where they join with the beryllium nuclei to form carbon plus neutrons. The reaction is shown by the formula:

$$^{9}Be_{4} + {}^{4}He_{2} \dashrightarrow {}^{13}C_{6} \dashrightarrow {}^{12}C_{6} + {}^{1}n_{0}$$

where the superscripts are the atomic weights and the subscripts the charge.

The stream of positive particles from the cyclotron may also be used to bombard beryllium and thus produce neutrons. The high energy and great

number of cyclotron particles make them more efficient neutron makers than the natural radio-alpha particles.

Once created, the neutron beam is directed against a uranium target. The products are studied in various ways. If the investigators want to find the energy of the fragments, the target is placed in an ionization chamber, filled with a gas at low pressure. The fragments rip through the gas atoms, disrupting their outer electron structure to form ions. The gas ions are drawn to a wire where they constitute a tiny electric current, and the magnitude of this current gives a clue to the energy of the fission products.

If the experimenters want the range of the particles — that is, the distance they travel before their kinetic energy is all used up — they may choose a Wilson cloud chamber which automatically photographs the track of ions the nucleus leaves behind it.

If they want to know the number of fissions occurring in a given time, they have an electric counter at their command, based on the same principle as the ionization chamber. A modification of the same instrument is used to look for electrons or neutrons emitted in the fission process or in the chain reactions that follow.

The problem of identifying the products is a somewhat different one, and is complicated by the large number of elements which may be formed. Here the debris is collected on a sheet of Cellophane or paper placed close to the uranium target. Each variety of isotope on the sheet has a definite rate of

disintegration — it may be anywhere from a fraction of a second to several days — and this time is characteristic of the element to which the isotope belongs.

To measure this period of decay, the collecting paper is placed near an electric counter. If the activity of one product decays to half its original value in 87 minutes, for example, that product is immediately known as an isotope of barium, $^{139}Ba_{56}$, which is known from other experiments to have a characteristic "half life" of 87 minutes. The difficulty of this method of identification is, of course, in separating the half-live when two or more elements are decaying together; and also in classifying a half-life belonging to an isotope previously unknown.

Another method of studying the products is to perform the experiment under water, then analyze the water chemically. Suppose we suspect that a few nuclei of radioactive lanthanum are present. This is too small a quantity to separate directly. But if a larger amount of a stable lanthanum compound is added to the water, both stable and un-stable lanthanum atoms can be precipitated out. If this precipitate is then shown to be radioactive, we have proved our suspicion was correct. Similarly the water can be tested for radioactive barium by adding a stable barium compound and so on.

Still a third attack on the problem of identification has been made by Philip Abelson at the University of California. He had been studying the natural X rays from the supposed "transuranic elements"; and put on the right track by the discovery of nuclear fission, he quickly showed that these X rays had wavelengths characteristic of iodine and tellurium.

Research along all these lines is proceeding at breakneck speed. Experiments similar to those with uranium have been performed on thorium ($^{232}Th_{90}$) with similar results, except that only fast neutrons are effective in splitting the thorium nucleus, while both fast and slow work well on uranium. Other heavy elements, such as gold and tungsten, show some slight tendency to undergo fission.

Fermi and others have been trying to determine which of the three uranium isotopes are involved, and how the process is related to the speed of the neutron projectiles. Duke University scientists are investigating gamma radiations connected with fission, and the University of California is piling up data in all branches of the research. Bohr at Princeton, Solomon in Paris, and many another are concerning themselves chiefly with theory.

Irene Curie and P. Savitch, who were responsible for much of the ground work enabling Hahn to identify the products of his fission experiments, have been carrying on the classification work in Paris. Joliot, as well as groups of physicists at Columbia, the Carnegie Institution, and Cambridge University, have concentrated on the study of secondary neutrons emitted at the moment of fission and in later reactions.

The latter problem brings up an interesting and rather disturbing aspect of the case. These secondary neutrons constitute a fresh supply of "bullets" to produce new fissions. Thus we are faced with a vicious circle, with one explosion setting off another, and energy being continuously and

cumulatively released. It is probable that a sufficiently large mass of uranium would be explosive if its atoms once got well started dividing. As a matter of fact, the scientists are pretty nervous over the dangerous forces they are unleashing, and are hurriedly devising means to control them.

It may or may not be significant that, since early spring, no accounts of research on nuclear fission have been heard from Germany — not even from discoverer Hahn. It is not unlikely that the German government, spotting a potentially powerful weapon of war, has imposed military secrecy on all recent German investigations. A large concentration of isotope 235, subjected to neutron bombardment, might conceivably blow up all London or Paris.

It has been impossible, even in this long article, to mention all the thousand aspects of this fascinating phenomenon, or name many of the able contributors to the sum of information amassed since last January. But the fact remains that nuclear fission is the most important scientific discovery of the year, and holds who knows what promise for the future.

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The Uranium Problem by Werner Heisenberg (1942)

Full title: The Theoretical Foundations for Obtaining Energy from Fission of Uranium

{*Manuscript of the lecture delivered February 26, 1942 at the House of German Research*.}

At the beginning of the work on the uranium problem, done in the framework of the Army Weapons Bureau task force, the following experimental facts became known:

1) Normal uranium is a mixture of three isotopes: $^{238}U_{92}$, $^{235}U_{92}$ and $^{234}U_{92}$ which are found in natural minerals approximately in the relationship 1:1/140:1/17,000.
2) The uranium nuclei can, as Hahn and Strassmann discovered, be split by means of neutron irradiation; specifically, the nucleus of $^{235}U_{92}$ by neutrons of all (including low) energies (Bohr), and the nuclei of $^{238}U_{92}$ and $^{234}U_{92}$ only by means of fast neutrons.
3) Each fission releases, per atomic nucleus, an energy of about 150 to 200 million electron volts. This energy is about 100 million times greater, per atom, than the energies released in chemical reactions. Furthermore, in each fission reaction a few neutrons are ejected from the atomic nucleus.

From these facts can be concluded: If one managed, for example, to split all the nuclei of 1 ton of uranium, an enormous energy of about 15 trillion

kilocalories would be released. It had been known for a long time that such high amounts of energy are released in nuclear transmutations. Before the discovery of fission, however, there was no prospect of inducing nuclear reactions in large quantities of material. For in artificially induced reactions in high-voltage facilities, cyclotrons and so on, the expenditure of energy is always much greater than the energy produced.

The fact that in the fission process several neutrons are ejected opens the prospect, on the other hand, that the transformation of large quantities of material could be effected in a chain reaction. The neutrons ejected in fission would, for their part, split other uranium nuclei, more neutrons would be produced, and so on; by repeating this process many times one obtains an ever greater increase in the number of neutrons, which only stops when a large proportion of the substance has been transformed.

Before addressing the question of whether this program can be carried out in practice, it will be necessary to study more closely the various processes that can generate a neutron from uranium. A neutron liberated in fission can either, if it has enough energy, after traveling a short distance, collide with another uranium nucleus, split it and generate another neutron, or it can—and unfortunately this is much more likely—just give up energy in the collision to the nucleus, without splitting it, whereupon the neutron continues on its way with less energy. In this case the energy of the neutron will be so small after a few collisions that only the following possibilities exist for its destiny: In the course of colliding with an atom it can get stuck in the nucleus, in which case further propagation is impossible; or—and this

unfortunately is rather improbable—it can collide with a nucleus of $^{235}U_{92}$ and split it. Then further neutrons are generated in the process, and the events just described can begin again. Some of the neutrons can escape from the surface of the uranium bulk and thereby be lost.

The exact description of the probabilities of each process taking place was an important programmatic point in the work of the task force, and Mr. Bothe will report on the results.

For our purposes it is sufficient to state that in natural uranium, neutron absorption (in which a neutron is captured by $^{238}U_{92}$, yielding the new isotope $^{239}U_{92}$) is much more common than fission or propagation.

Therefore the chain reaction we are looking for cannot take place in natural uranium, and one has to sniff out new ways and means of effecting initiation of the chain reaction.

The behavior of the neutrons in uranium can be compared to the behavior of a population, such that the fission process has an analog in marriage and neutron capture in death. In normal uranium the death toll greatly outweighs the number of births, so that the existing population always will have to die out after a short time.

An improvement in the fundamentals obviously is possible only if one succeeds in (1) raising the number of births per marriage, (2) boosting the number of marriages or (3) reducing the probability of death.

Possibility (1) does not exist in the neutron population, because the number of neutrons per fission is established by natural laws and constants that cannot be influenced. (For the determination of these important constants, take note of the talk by Mr. Bothe.)

There remain therefore only paths (2) and (3). An increase in the number of fissions can be reached if one enriches the uranium in the fissionable but much rarer isotope $^{235}U_{92}$. If in fact one succeeded in producing pure $^{235}U_{92}$, then the conditions would come into play that are portrayed on the right side of the first figure. Every neutron would, after one or more collisions, cause another fission, provided it did not escape from the surface. The probability of death by neutron capture is vanishingly small compared with the probability of propagation. So if one just assembles a certain amount of $^{235}U_{92}$, so that neutron loss through the surface stays small compared with internal multiplication, then the number of neutrons will increase enormously in a very short time and the whole fission energy of 15 trillion kilocalories per ton is released in a fraction of a second. The pure isotope $^{235}U_{92}$ undoubtedly represents, then, an explosive material of unimaginable force. Granted, this explosive is very hard to obtain.

A big part of the work of the Army Weapons Bureau task force has been devoted to the problem of enrichment, that is, the production of pure $^{235}U_{92}$. American research also appears to be oriented in this direction, with considerable emphasis. In the course of this session Mr. Clusius will report on the status of this question, and so I will not have to go into it any further.

There remains to be discussed now only the third possibility for initiating the chain reaction: reduction of the death toll, that is, the probability of neutron capture. According to general principles of nuclear physics it can be assumed that the probability of capture becomes large only at very specific neutron energy levels. (The investigations of the past year have yielded valuable results on just this point.) If one succeeded in quickly slowing the neutrons, without too many collisions, to the region of lowest possible energies (that is, the energy region given by thermal motion), then one could reduce the death toll substantially. In practice one can effect a rapid diminution of neutron speed by adding suitable braking substances, (editor's note: *a moderator*) that is, substances whose nuclei—when hit by a neutron—take away part of the neutron's energy. If one adds enough braking substance, then one can bring the neutrons without danger into the region of lowest energies. But unfortunately most braking substances have the property of also capturing neutrons, so that too much braking substance will increase the probability of capture, that is, the death toll. These relations are portrayed
schematically on the other side of the first figure.

It is a question, accordingly, of finding a moderator that quickly removes energy from a neutron without, as far as possible, absorbing it.

The one substance that does not absorb at all, helium, unfortunately cannot be used because of its low density. The most suitable material almost certainly is deuterium, which is available in its simplest combination— and

also in sufficient proportion—in water. Admittedly, heavy water is not easy to obtain in large quantities. The task force has initiated thorough investigations into the production of heavy water and other substances that are possibilities, such as beryllium and carbon.

Pursuant to an idea of Harteck, it has proved advisable to separate the uranium and the moderator, so that the kind of arrangements result that are seen in the layered ball shown in the second and third figures, which was built as a small-scale experiment at the Kaiser-Wilhelm Institute.

Whether this kind of layering of natural uranium and moderator can lead to a chain reaction and therewith to the liberation of large energies, that is, whether the "death rate" can be reduced enough for the "birth rate" to outweigh it, so that an increase in the population begins, has to be regarded as a completely open question, since the properties of the few substances that can be used as moderators are given and cannot be changed.

To illuminate this point was again one of the most important assignments of the task force.

Let us now assume for a moment that this question has been resolved in a positive sense; then it still has to be investigated how this particular arrangement behaves with greater multiplication of the neutron population. It turned out that multiplication does not stop only when a greater part of the uranium is transformed, but much sooner. The ever greater propagation leads in fact to a strong warming, and with the warming— since the neutrons

move faster and therefore spend less time in the neighborhood of a uranium nucleus—the probability of fission gets smaller. The warming has as a consequence, then, a diminution in the number of "marriages" and hence in the multiplication; because of that, at a certain temperature the neutron multiplication will be exactly balanced by absorption.

So the layered arrangement as described will stabilize itself at a certain temperature. As soon as energy is drawn from the machine, cooling and a renewed multiplication set in, and the drawn energy in turn is replaced by fission energies; the machine stays for all practical purposes at the same temperature.

One arrives with this at a machine that is suitable for heating a steam turbine and that can put its very large energies over a period of time at the disposal of such a thermal power machine. One can therefore think of practical applications for such machines in transportation, especially in ships, which would acquire enormous range from the huge energy reserve contained in a relatively small quantity of uranium. That such a machine does not burn any oxygen would be a particular advantage if used in submarines.

As soon as such a machine is in operation, the question of how to obtain explosive material, according to an idea of von Weizsäcker, takes a new turn. In the transmutation of the uranium in the machine, a new substance comes into existence, element 94, which very probably—just like $^{235}U_{92}$ —is an explosive of equally unimaginable force. This substance is much easier to

obtain from uranium than $^{235}U_{92}$, however, since it can be separated from uranium by chemical means.

Whether a mixture of uranium and moderator can be found in which the chain reaction can take its course has still—as stated—to be determined by experiment. But also, when such a mixture is found, a large quantity of this mixture must still be amassed to allow the chain reaction really to run, since with smaller quantities the loss of neutrons through the surface always will be greater than the internal multiplication. Experiments with very small quantities of substance are therefore from the outset insufficient for deciding the suitability of the mixtures for the chain reaction. Without generous support of the research work—with materials, radioactive sources, funds—as obtained from the Army Weapons Bureau, it would not have been possible to progress. But even with the larger quantities— for example, of heavy water—that have been made available, the chain reaction still cannot take place. Therefore we must still touch on the question of how one can recognize in a small-scale experiment whether in the chosen mixture the "birth rate" is outweighing the "death rate."

To resolve this question effectively, one introduces into the mixture a neutron source about which it is known how many neutrons per second it emits. If the number of neutrons escaping from the mixture is greater than the number introduced with the source, then one can conclude that multiplication is outweighing absorption and that a suitable mixture has been found.

Experiments conducted in Leipzig in the last few years have shown that a certain mixture of heavy water and uranium actually has the desired properties. To be sure, the surplus of the "birth rate" over the "death rate" was so small in these experiments that it was canceled by additional absorption in the container material. But the container material can be dispensed with later or can be replaced by something else.

To the extent one can extrapolate from laboratory-scale experiments to large-scale experiments, the experiments unequivocally support the possibility that with a layering of uranium and moderator a machine can be built as indicated. The results to date can be summarized as follows:

1) Obtaining energy from uranium fission is undoubtedly possible if enrichment in the $^{235}U_{92}$ isotope is successful. Production of *pure* $^{235}U_{92}$ would lead to an explosive of unimaginable force.
2) Natural uranium also can be used for energy production in a layered arrangement with heavy water. A layered arrangement of these substances can transfer its great energy reserve over a period of time to a thermal power machine. Such a reactor provides a means of liberating very large, usable quantities of energy from relatively small quantities of substance.

An operational machine can also be used to obtain a hugely powerful explosive; over and above that, it promises a number of other scientifically and technically important applications, which go beyond the scope of this talk.

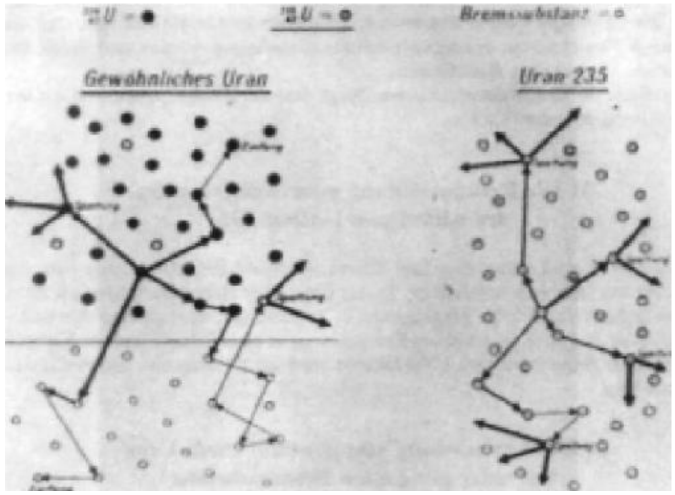

Fig. 1: Normal Uranium with a moderator (left) pure $^{235}U_{92}$ (right)

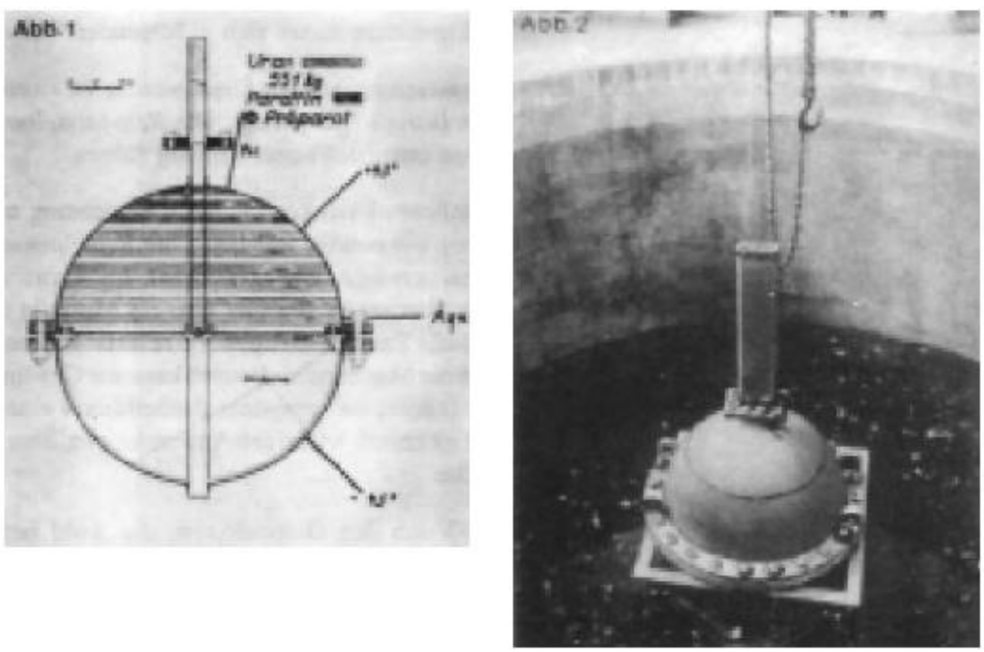

Fig. 2: Schematic of a pile Experiment, with alternating layers of Uranium metal plates (550 kg) and paraffin, enclosed in a stainless steel sphere (left) and in light water pool (right)

spaltung means “fission” and *einfang* “capture.”

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